Telephone Engineer

Volume 33 SEPTEMBER, 1929 No. 9

Making and Using the Budget

One of the standard practices of modern business is the budget form of control of operations. This applies not only to large businesses but to many of the smaller ones as well. In public business in many states, each political subdivision, no matter how small, is required to make a budget and publish it for public information in advance of its adoption. While the use of the budget is common in the telephone business and has been developed to a very high degree in many companies, there are still many companies that still follow a hit-or-miss, go-as-you-please, day-by-day method of planning operations.

The lack of legal requirement or other incentive probably is responsible for this in some places where the management is of the non-progressive type. In other places, it may simply be the lack of information as to how to proceed. Actually the problem of preparing a simple budget is not difficult. Roughly it is comparable to the difficulty of preparing a budget in the governmental unit in which the company operates. If the township trustee or the local school board can prepare a budget so can the telephone manager.

The initial step is to make an estimate of probable revenue and normal operating expenses. From this can be determined probable resources available for return on investment and for replacements and improvements of plant. A survey of the plant and rough estimates of the cost of the various portions of construction and reconstruction planned for the next year gives the amount of additional capital required to be furnished either from existing resources or from new sources. With these figures available, the balancing of resources and expenditures can be made and the simple budget is complete.

As the end of the current year is approaching, the assembling of this information should be begun and the new year can be started with a definite program to be accomplished. After a year or two experience the making of a budget becomes a relatively easy matter and few companies that have adopted the plan are satisfied to revert to the old method of no budget and no program.

Some Brakes on Telephone Growth

A month ago we commented in these columns on the subject of the saturation point of telephone density. The idea was expressed that the saturation point was a fixed point only if all conditions were kept unchanged. Since that time, whenever opportunity offered we have been discussing this subject with telephone men in an endeavor to get their views and ideas of some of the forces which are acting as brakes on telephone growth where growth is not being realized. Strangely enough, we found that not a single one of the men we talked to considered that the communities which he knew were using all of the telephone service that they needed.

Pretty generally these men were agreed that one reason for lack of growth where such a condition exists has been the lack of selling effort. This has been the subject of much comment and requires no further discussion other than to state that wherever an organized selling campaign has been conducted the results have invariably been favorable.

One manager expressed that conviction that a thorough canvass of every community should be made once every three years.

Another restraining force mentioned by several men is the high initial payment exacted in some cases before service is given. This charge may take the form of the purchase of a telephone instrument and a share in the line in the case of a mutual company; a large payment in advance for service, a subscriber deposit or service connection charge in the case of a commercial company. Some of the figures cited were surprisingly large. In the case of

mutual companies, the initial outlay might be as high as thirty dollars or more. One small commercial company was cited as charging a straight service connection charge of twelve dollars some years ago, although it is not certain that this is still in effect. The necessity of some form of initial payment is well established but it should be adjusted to a reasonable basis that will not prevent any desirable subscriber from obtaining or keeping the service.

Another brake mentioned by only one person is too rigid collection policies. A telephone company may be very proud of a record of 99.97 percent collections, but such a record may sometimes be made at the expense of growth of new business. A liberalizing of collection rules might increase the losses a fraction of one percent and yet result in several percent growth in gross and net revenue. A sound policy in this regard would be the establishment of collection practices that will not permit losses to run over a reasonable maximum and still have a minimum effect upon growth of the business.

Another possible deterrent of growth is a rate schedule higher than the value of the service warrants. Under present conditions it is probable that there are few communities where this is true, but it has been true in the past, as is witnessed by experience of early day operations of some of the Bell companies in small communities. It may again be true if rate schedules are pushed up and service areas are restricted in an endeavor to bring up earnings to the point of paying a return on inflated valuations.

Whenever telephone development in any area is stationary at a point below the reasonable needs of the community for service it is certain that one or more of these brakes is operating. In such a situation, an analysis of conditions and the removal of the restraining forces will undoubtedly result in a satisfactory gain in stations served and in gross and net revenue derived from the service.

Convincing the Public

"One of the best contributions the plant department can make toward good public relations is to keep the public convinced that we are always on the job to keep the plant up to a high standard of service," said the plant manager of a telephone company recently. "When a plant man goes to a house and announces that he is to rerun a drop or replace inside wire upon which no trouble has been reported, he immediately establishes in the mind of the subscriber the fact that we are keeping track of conditions and maintaining the plant in such a way that trouble will be kept to a minimum. We have found that periodic overhauling and removal of all plant of doubtful serviceability, together with regular inspection of station equipment at reasonable intervals does much in keeping the public satisfied."

There is material for an editorial in this statement, but the statement without amplification is an editorial in itself. After all, the job of maintaining good public relations is largely one of keeping the public informed that the telephone company is on the job to maintain the best possible service at all times.

Keeping the Machinery Well Oiled

In a mechanical age like the present everyone is familiar with the effect of friction on the operation of a piece of machinery. Engineers and designers are working constantly to reduce the possibility of losses due to friction and operators of machinery are trained to keep the machines properly lubricated so that losses in operation are kept to a minimum.

What is true of inanimate machines of steel and brass is likewise true of the human machinery necessary for the operation of any business. One of the problems of management is to keep to a minimum the friction within departments and between departments of a modern business.

Every business organization has within it the possibility of intra and inter-departmental friction. In this respect the telephone business is probably no better or no worse than any other.

There are countless possibilities of friction between John Smith, the lineman, and Mary Jones, the operator, whether they are the two individuals responsible for the operation of the small exchange or the personification of the thousands of individuals necessary to the operation of a large system. Whenever such friction occurs there is loss in efficiency.

Just as the effect of friction in a machine is revealed to a bystander by a squeaking bearing so is the friction in the human machinery revealed by unguarded comments and by "passing the buck" between departments. In the telephone business such a revelation quickly results in loss of public confidence in the efficiency of the machine.

In human machinery the proper lubricant is a complete understanding by each individual of his job, its relation to the jobs of each other individual and of the entire job that is to be done. It is the duty of management to see that this lubricant is of a quality and is applied in sufficient quantity that friction losses are kept down to a negligible amount.

Aerial Cable Construction

This Is Another of the Very Able Articles of Ray Blain and Gives Some Practical Suggestions for the Construction of a Sightly and Trouble-Free Aerial Cable System

Perhaps the most interesting part of all construction work is the erection of new aerial cable systems. This is due no doubt to the fact that conditions and problems are so varied that the work does not become monotonous. After the job is completed, if the poles are correctly set, corners well placed, messenger pulled to the proper tension, rings equally spaced and cable straight and free from kinks, in addition to having a serviceable system it is also a thing of beauty which will gladden the heart of all real telephone men.

The Pole Line

Laying out pole line, setting poles, placing guys and anchors for aerial cable differs but slightly from the methods already described for "Open wire pole line construction." Small poles should never be used on cable leads as they may have a tendency to buckle under the load. It is also a good practice to use extra heavy poles on all corners if possible for the corners are mighty important on the aerial cable lead.

On account of the high cost and difficulty in replacing poles on a cable line they should always be treated as this more than doubles their natural life.

When locating poles on an aerial exchange cable system it is always advisable to consider well the following rules before the actual work is started.

Avoid all trees that may grow into cable later when difficulty may be expected in trimming.

Locate pole lines in alleys rather than on streets, where possible.

Avoid making attachments to buildings if there is any other possible way of doing the job.

Never locate poles or anchors on private property if it can possibly be avoided.

Step all terminal or other poles that will be climbed frequently.

Locate terminal poles so as to facilitate distribution as much as possible.

Where possible to avoid, never set poles in front of houses located near sidewalks. At least do not set them so as to obstruct view from windows.

Locate poles so as to give all possible clearance from lighting systems.

A careful consideration of the above points before the actual construction work is started will in most cases result in a much more satisfactory job upon its completion.

Anchors and Guys

On all aerial cable leads extreme care should be taken to have anchors and guys placed on the exact pull of the corners. Guys can best be located correctly by the method indicated in Fig. 1. Measure two points an equal distance from the corner in line with the lead, A-B and A-C, which in this case is 32 ft. Now measure the distance in a direct line between C-B, which in this case is 54 ft. Now locate a point "D" in the exact center

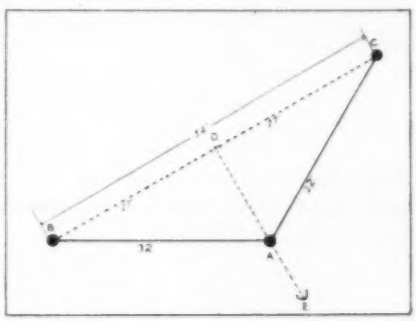


Fig. 1—Method of locating guys on direct pull of corner

by measuring off one-half the distance C-B, or 27 ft. Now sight the anchor E on a direct line with A which will place the guy on the direct pull of the corner. The rule of having the length of the guy at least equal to the height as specified in "open wire pole line construction" should be strictly adhered to in cable construction. The size of the guy strand should be at least as large as the suspension strand and a good practice approved by many is to have it larger.

Patent anchors can be used to good advantage except in wet, sandy or marshy land. On the average cable job they will do the trick better and much cheaper than the obsolete and expensive log type despite the contrary view of many construction men. On an extra heavy corner where one patent anchor is not considered sufficient two may be used with separate guys, one attached to the pole above the suspension strand and the other below it. This arrangement gives a better job than the average log anchor on a corner with extra heavy strain. Fig. 2 shows a corner where triple guys are used. Tests have been made on patent anchors where a certain type withstood a strain of 17,000 pounds and even then the rod broke and the anchor was still in a servicable condition when dug up. Rare indeed would be the time that a corner would exert a strain greater than this on an ordinary cable job.

The use of an anchor rod smaller than 5/8 inch by 6 or 8 ft. is not considered advisable on cable work. The thimble-eye rod is to be preferred, but if a thimble is to be used it should be of sufficient size and weight to hold the guy strand under strain without bending out of shape.

In general guys and messenger will be dead-ended on poles using 4 by 8 inch galvanized strain plates to prevent them from cutting into the wood. There is, however, coming into general practice a method, and it is believed to be a good one of dead-ending the messenger in an eye bolt. The washer on the back side of the pole under the nut of the eye bolt carries an arrangement which provides for attaching the down guy. This makes a very neat job and simplifies construction.

It is preferable that all down guys be insulated from the suspension strand by dead-ending on separate sets of strain plates at least six inches apart on their nearest edge and by cutting in a strain insulator about midway of the guy. This insulator should be at least eight feet from the ground measured on a vertical line. A good heavy strain insulator should be used as small ones will many times break under strain when the messenger is being pulled. There is a boltless strain insulator on the market and used by many of the larger telephone companies with wonderful results. These are a decided improvement over the old "Johnnie Ball" type with guy clamps as they do a real job with a saving in both time and money.

Size of Strand

Three different sizes of strand are commonly used for aerial cable, 7/16 in. or 6,000 lbs., 3/8 in. or 10,000 lbs. and 5/16 in. or 6,000 lb. A size smaller than 6,000 lbs. is not recommended as it will not, in most cases, prove economical. Some engineers recommend the use of 10,000 lb. strand for cables up to and including 200 pair 22 ga. and 16,000 lb. for cables larger than 200 pair.

In cases of extreme large and heavy aerial cables or for extra long spans two 16,000 lb. strands can be used to good advantage. When the two messengers

are used, the cable is fastened to one with regular hangars and the other is clamped to the supporting messenger in the center of the span forming a catenary suspension. With this system of construction double guys and anchors are always advisable.

Type and Size of Cable Hangars

Care should always be exercised in the selection of a suitable cable ring, sometimes called cable hanger. A good ring

Fig. 2—Triple guys on heavy corner

will not damage the cable in the form of cuts near the pole, even after years of service. It has been proved that the swaying of the cable in the span sets up a twist at the poles and about three feet on either side. This partial rotation of the cable will cause the ring to cut into the lead if it is not perfectly smooth over its entire inner surface. If the contact surface between the cable and ring is large this condition is somewhat aggravated by the accumulation of dust and smoke that acts as an abrasive.

There is on the market a "V" shaped ring which forms a two point contact between the ring and the cable and is supposed to prevent any lateral movement of cable independent of the ring.

There is also on the market a cable clip which slips on the cable and grips the ring which is supposed to transfer the roll or torsion of the cable to the messenger wire. About four of these are used at each pole. The stranded messenger wire will absorb the twist or roll without injury and in this way saves the cable sheath from ring cuts and in many cases cracks from vibration. If you will notice old cable it is quite common to see a sleeve placed about three feet from the pole, perhaps on each side in nearly every span, the results of twist and vibration trouble.

Any ring requiring crimping pliers for their installation should never be considered as the galvanizing is generally cracked off by the crimping and corrosion and rust soon starts.

The type of ring that will permit the cable being pulled in from either direction has a decided advantage. It should also grip the messenger firmly and not snap off from vibration when pulling in cable as riding a new span to replace rings is always a disagreeable job and generally mars the appearance of the completed job. Cable rings should always be ordered to fit a specified messenger and care taken to see that they do fit correctly before being used.

It is good practice to use 2-in. rings for cables up to 200 pair 22 ga., 3-in. rings for cables up to 500 pair 22 ga. and 3½-in. rings for cables from 500 pair to 1,200 pair 22 ga. However, the use of cables larger than 400 or 500 pair for aerial work is not recommended. It is also good practice to space all rings of the 3-in. size and smaller 20 ins. apart. Larger rings should be spaced 16 ins. apart. Rings smaller than 2 ins. will not in general be economical to use.

Special Material

The rusting away of guys, messenger strand and cable hangers is a common occurrence especially over railroad crossings where the chemical action from the coal smoke causes rapid deterioration of ordinary galvanized products. This condition creates an economic need for a non-rusting messenger and cable hangers. The "Copperweld" products are ideal for this purpose as they have a copper covering which is not effected by this corrosive action. The slight increase in cost of this material over the ordinary type is offset by the increased safety in preventing a length of cable to fall down some night over a railroad crossing. I know of one such case where the rings rusted through and let a 200-pair cable fall down across a main line track. The next morning several hundred feet of it was picked up several miles from its original location where it had been dropped unceremoniously from the tender of a passing locomotive. Another great advantage of these copper coated products is that no replacement will be necessary for the entire life of the poles with a consequent saving in both labor and material.

Proper Clearance

Proper clearance between aerial cable, electrical circuits, railways and public highways is very important. All such clearances should be calculated at a temperature of 60 degrees with no wind. On railroad crossings the cable should clear the top of the rail not less than 27 ft. The supporting poles should clear the nearest rail not less than 12 ft. on the main lines and at least 7 ft. on all side tracks. When placing poles near railroad tracks care should always be taken not to obstruct the view of signal towers, switch lights, etc. When crossing over unloading tracks necessary clearance for the trucks and wagons should always be provided.

When passing over trolleys a clearance between the cable and the trolley of about 15 ft. should be maintained if possible. This is necessary so that if the trolley pole jumps the trolley it will not hit the cable and perhaps burn it by coming in contact with the trolley and the grounded lead covering of the cable. If this clearance cannot be observed a suitable guard should be placed over the cable and messenger for a distance of about ten feet on each side of the trolley.

Fig. 3—Cable bends

Clearance over sidewalks or other places accessible only to pedestrians need not clear over 10 ft. A clearance of at least 18 ft. should be maintained over all highways and over heavy traveled thoroughfares 20 ft. is much better and safer.

On joint pole lines where cable parallels primary circuits, carrying not over 7,500 volts, a clearance of not less than 6 ft. shall be maintained. When cable is above secondary circuits carrying 250 volts a clearance of 2 ft. is permissible but 3½ ft. is much better and is to be desired. When cable is below these secondary circuits a clearance of 3½ ft. should be maintained always. When cable is strong in cold weather its expansion during warm weather is generally less than parallel lighting circuits and this summer clearance should always be considered. Cable should clear transformers at least 3½ ft.

Tension of Strand

Opinions differ greatly among telephone construction men as to what tension messenger should be pulled for aerial cable. Tight messengers present a more pleasing appearance and there is always a

temptation on the part of the line foreman to pull it about as tight as the corners will stand.

It has been proved beyond a doubt that the messenger should be left fairly slack as on a loose messenger the cable does not vibrate as much as on a tight one and creeping and bowing is practically eliminated.

When a new aerial cable is placed in service we assume that the supporting messenger and cable are of equal length in each span. When the temperature rises above the point at which the cable was spliced both it and the messenger will expand, but the expansion of the lead cable will be greater than that of the messenger. Due to this unequal expansion and the fact that cable cannot slide through the rings to any extent after it gets out, compression sets up within the cable which after reaching a certain value will cause slack to form in bends or curves at various points along the line. When there is a sudden temperature drop the contraction of the lead is faster than the steel and when the temperature drops considerably lower than that at which the cable was spliced it may cause a permanent stretching of the cable and upon the next expansion cause more serious bowing of the cable. Examples of bowing are shown in Figs. 3 and 4. Lead sheath usually crystallizes quickly in bends as much of the vibration of the span is absorbed at these points, and causes the sheath to crack. It has been proved that cable will not bow to any extent if suspended on a messenger of proper tension. "Strand Dynamometers" have been developed which makes pulling of new messenger to proper tension a simple matter. It is hoped that some enterprising manufacturer will soon place these daynamometers on the market at a cost low enough to be within reach of every telephone company that makes use of aerial cable so that it can be placed at the proper tension without difficulty.

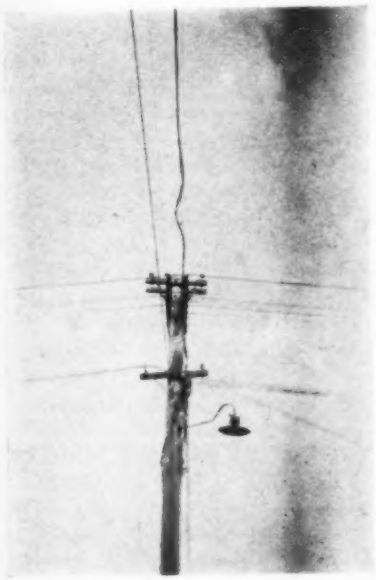


Fig. 4—Cable bends in aerial cable

The sighting-in of messenger as in the open wire method is not very successful. A better plan is to throw a hand line over the messenger in the center of the span and have a man swing on it while another watches the sag pulled into the span from the top of the pole. In this manner the sag that will be caused by the weight of the cable can be estimated fairly accurately.

Planning the Cable Plant

When planning the cable plant a complete study of details should be made in an effort to forecast with some degree of accuracy the ultimate requirements of the system during its average life. The average life of any cable system will vary in different exchanges. Climatic conditions, type and quality of construction, quality of material and maintenance will be the principal governing factors that will extend or limit the life of a cable system. By the average life is meant the useful economical life, for when a cable reaches a certain point of depreciation it is generally more economical to replace with a new one than to keep the old in repair.

Too often in the interest of economy, cables of too small a capacity are specified for the new cable plant. When this is the case it generally happens that after a few years the cables fill up and the plant has to be worked over and enlarged. This replacement of cables is expensive in both labor and material and the cost in the end is generally much more than it would have been had ample sized cables been used on the original installation.

To avoid these costly mistakes all possible growth should be considered at the time the forecast study is made, then multiply the number of pairs actually needed by two. There is far more danger of having cable too small than too large. The use of cables smaller than 25 pair for any purpose is not recommended. The difference in cost between a small and a large cable is so slight that it does not pay to take a chance of getting a cable so small that its replacement will be necessary in only a few short years.

E. B. Craft Dead

It is with profound sorrow that we report the death on August 20th of Edward Beech Craft, executive vice-president of the Bell Telephone Laboratories, New York City. Mr. Craft had been ill for several months due to high blood pressure. He is survived by a widow, Mary Ann Richards Craft, to whom he was wedded in 1902, and a daughter, Virginia Craft. He was 48 years old.

Mr. Craft was born in Cortland, Ohio, September 12th, 1881. Received his common school, also high school, education in Warren, Ohio. It was in Warren that he started his work.

From 1900 to 1902 he was superintendent of the lamp department of the Warren Electrical and Specialty Company. Resigning this position, he went to Chicago, where he secured a position with the Western Electric Company, feeling that that organization was doing the kind of work he wanted and that it offered exceptional opportunity.

His first job was editing orders for telephone switchboards. The interest and ability which he manifested won him the opportunity he wanted, and he was put in charge of development work. This opportunity started the first part of his career—that of invention. His first patent was for an indicating device for fuses. This invention was so fundamentally correct in the economies of its design that it has remained constantly in use as the No. 35 type fuse for the past twenty-five years. Of all his inventive contributions to telephony, that of the flat-type relay in 1910 is pre-eminent.

In 1926 he received the degree of Doctor of Engineering from Worcester Polytechnic Institute. On that occasion he was styled—

"Engineer, Inventor and Organizer of Research, whose inventions take part daily in each of more than fifty million telephone conversations; whose genius, initial conception of the practicability of panel systems for machine switching, and continued supervision of its development have contributed largely to the present system of telephony; whose technical experience devoted to the service of his country during the World War hastened advances in radio communication with aircraft; whose organizing ability, continuously applied for a quarter of a century to engineering development and industrial research, has increased the social and economic significance of research."

Vote to Sell Jersey Phone Company

Hightstown, N. J.—Frank R. Adams, secretary of the Farmers and Traders Telephone Company, announced today that the stockholders had voted to sell the entire stock of the company to the New Jersey Bell Telephone Company for $195,000. The Farmers and Traders Telephone Company was organized May 24, 1899. At that time the stock was valued at $27,000. The company has plants at Hightstown, Cranberry and Plainsboro, N. J. Adams said the actual transfer will not be made until January 1, 1930.

Studying Telephone Methods

This Is Chapter 31 of a Series of Articles by E. R. Collins.
Manitoba Telephone System, Brandon, Manitoba, Canada.
This Chapter Deals with the Plunger Type Line Switch.

The system discussed in chapter 30 is suitable for giving service to only a limited number of telephones, and on account of using only a 12-volt battery, the length of each line will necessarily be relatively short. In this chapter we will study something about a piece of equipment which will be used in building up a large system. There are four major pieces of equipment necessary for a system of 100 lines or more. They are the line switch, the master switch, the selector and the connector. We will need to study each one separately, and then combine them to build up a complete system.

Line and Cutoff Relays

You will remember that we studied the features of the line and cutoff relay system commonly found on a central energy switchboard. The equipment necessary is shown in the schematic drawing, Fig. 249.

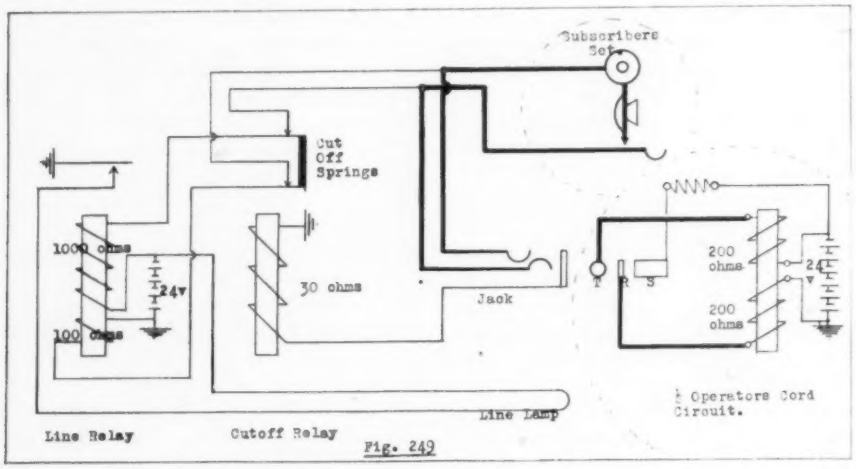


Fig. 249

There is connected to the telephone the windings of the line relay. One winding is 1,000 ohms, while the other is 100 ohms. When the subscriber removes the receiver, he will hear a humming noise until the operator answers. The intensity of this hum will depend on the length of the line, also on the length and intensity of any inductive interference such as power or light lines. The unbalanced impedance of the line relay coils is primarily responsible for the noise, but the intensity will vary with different lines connected. When the operator answers, by inserting her answering plug, she does three things. First causes the cutoff relay to pull up, and cut the circuit between the telephone and the line relay coil, with the cutoff springs. Second, puts out the line lamp, because the line relay will be released when the cutoff springs open the circuit to the line. Third, she will connect battery from her cord circuit to the subscriber's telephone over her cord, plug and the pack of the line. We have shown here an impedance coil supplying battery to the telephone. The other half of the cord circuit is omitted for a purpose. We have shown the resistance of the impedance coil as 200 ohms to a side in Fig. 249. This should have been 100 ohms to a side for a 24-volt battery supply. The 200 ohms would have been correct for a 48-volt battery supply. All that has been done for the subscriber so far is to put out the line lamp, and give him a quiet line due to the balanced battery feed. We suppose for the time that the operator does not say number. We will leave it that way till next month, not that an operator would take that long to answer, but in the following description of the line switch operation that is as far as we will give the subscriber service. Consider therefore that the subscriber is waiting for the operator to say "number, please?" and the operator has her answering plug in the jack, but has not yet opened the key to say number.

Now refer to Fig. 250. Here we have a set of apparatus which has several points of similarity to Fig. 249. You will note first of all that the telephone is connected to ground on one side. This is the positive or ground side of the line. The negative side of the line is connected to negative battery through a 500 ohm line relay coil. As soon as the subscriber removed the receiver from the hook, we would hear the hum on his line due to the unbalanced condition. The hum would be worse in this case, as there would be practically no impedance in the positive side of the line. In Fig. 250 there is no impedance in the positive side, but in actual practice there would be a low resistance relay of very little impedance which is common to a group of lines, to which the positive lines of this group would be connected. This is known as the supervisory ground relay and will be dealt with later.

The lines from the ground and the line relay coil are taken through a set of contacts similar to the cutoff relay springs in Fig. 249. These are spoken of as the bridge cutoff springs or more commonly as the B. C. O. springs. They are of course normally closed. The 500 ohm coil of the line relay is slow to pull up and slow to release. The delay in the pullup action, however, is very slight, but the release action is quite noticeable.

Bridge Cutoff and Pull Down Coils

The cutoff relay is of rather peculiar construction. In the first place the coil has two windings, one a low resistance and the other high resistance. We will assume the low coil is 45 ohms and the high 1,200 ohms. There are two armatures connected to the relay heel piece with a common set of pivot screws. The upper part of the core of the B. C. O. or bridge cutoff coil is cut away. The small armature fits down in the cut away section, and when it is pulled in the lever of this armature moves to the left, and moves the B. C. O. springs. Therefore if the small or B. C. O. armature is pulled in the B. C. O. springs are opened, and the line relay and ground are cut away from the line. If the outer winding of the 1,200-ohm coil is grounded, there will be sufficient energy in the coil to pull in the B. C. O. armature and operate the B. C. O. springs. In actual practice these springs are adjusted so that they will pull up when the 1,200-ohm coil is grounded in series with 650 ohms, and not pull up with a 1,200-ohm coil in series, using a 48-volt battery in either case.

The 1,200-ohm winding is therefore called the B. C. O. winding. The 45-ohm coil is connected to ground when the line relay is energized. This means that there would be over 1 ampere current flow in this coil if the line relay were energized.

The result would be a much greater magnetic pull on this coil than there would be with the 1,200-ohm coil. The 45-ohm coil when energized will operate the larger armature which is held back with a still tension spring. On the right end of the large armature is shown a plunger. On the end of the plunger is shown a wedge of some insulating material. If this plunger is shoved down far enough it will pass in between the curved springs below it and cause the curved springs to bend out until they came in contact with the corresponding straight springs. This

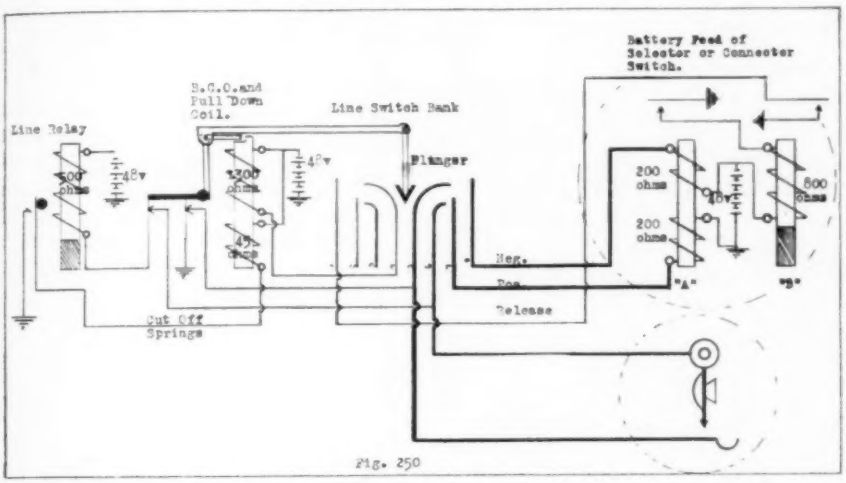


Fig. 250

set of springs we call the line switch bank. The arrangement of the plunger and the bank springs is shown in more detail in Fig. 251. Springs 1-2 and 7-8 are held flat against flat insulators. Springs 3-4 and 5-6 are similarly separated with flat insulators. There are metal mountings plated at the top and the bottom of the bank, and other pieces not shown filling in between, and all insulated from the contact springs. The actual plunger assembly consists of two hard rubber or composition rollers mounted with light springs on a very light metal plunger. The rollers come in contact with the curved springs. Therefore if the plunger in Fig. 251 is forced to the left, the rollers will force springs 3-4 up and 5-6 down until they come in contact with 2-1 and 8-7 respectively. When the tips of the curved springs come in contact with the flat springs, their downward and upward motion is stopped, and further bending caused by the travel of the rollers forces the tips of the curved springs to the right. This causes a wiping motion, which keeps these contact surfaces clean. The springs are made of a special non-corroding material and present a good electrical contact surface. In Fig. 251 the plunger is shown pivoted to the plunger armature.

Referring again to Fig. 250, it will be seen that spring 7 and 8 are connected to the windings of a relay coil. This is the "A" relay of a connector or a selector switch. Associated with the "A" relay is a slow release "B" relay. The armature of the "B" relay is connected to spring No. 1 on the line switch bank.

We will suppose now that the subscriber removes the receiver from the hook. Negative battery will flow from the 500-ohm line relay over the B. C. O. contact, through the telephone back to ground over the other B. C. O. contact spring. This will cause the line relay to operate. The line relay contacts close, and battery will flow through the 45-ohm winding of the B. C. O. coil and energize this coil. Due to the heavy current flow the pull down armature will be pulled down till its armature hits the core of the coil. But at the same time this heavy current flow will also pull in the small B. C. O. armature. This will open up the B. C. O. contacts and cut the line away from the line relay. The line relay coil is slow acting, so will hold on for a short time.

When the plunger forces the rollers between the curved springs, it causes the telephone line to be extended over the heavy black lines, Fig. 250, so that now the telephone receives its battery supply from the balanced winding of the "A" relay coil of the selector of connector as the case may be. This will cause the "a" relay to operate, and close the circuit to the "B" relay. This in turn operates the "B" relay armature, and grounds the wire connected to spring No. 1 of the line switch bank. But spring No. 1 is now connected with No. 4, so that battery will flow from the 1,200-ohm winding of the B. C. O. coil to ground at the "B" relay. But in the meantime the B. C. O. springs have cut the battery of the line relay coil. But this coil due to its slow release feature holds on till the ground at the "B" relay has been connected to the 1,200-ohm coil. Thus the 45-ohm coil remains energized until the 1,200-ohm coil is energized, and holds the pull down coil in. While the 1,200-ohm coil has not enough energy to cause the pull down coil to operate, it can hold the pull down armature in place after the 45-ohm coil has pulled it in. If you will now refer to Fig. 254, you will note that the both armatures are unoperated. There is quite a wide gap between the core and the pull down armature. This large gap to commence with requires a very intense field to cause the pull down armature to move. The B. C. O. armature in Fig. 254, while not pulled in, has a much smaller air gap to overcome, there being the pull due to the projection of the core acting on the end of the B. C. O. armature.

All that has taken place then can be summed up as follows:

1. Subscriber removes receiver.
2. Line relay pulls in, closing circuit to pull down coil.
3. Pull down coil operates both pull down armature and B. C. O. armature.
4. B. C. O. armature cuts line relay and ground away from line.
5. Line relay stays operated due to slow acting feature. Holds the pull down armature in.
6. Pull down armature forces plunger rollers between springs of the line switch banks. Connects "A" relay of selector or connector to telephone. Connects B. C. O. coil to armature of "B" relay.
7. "A" relay pulls up and energizes "B."

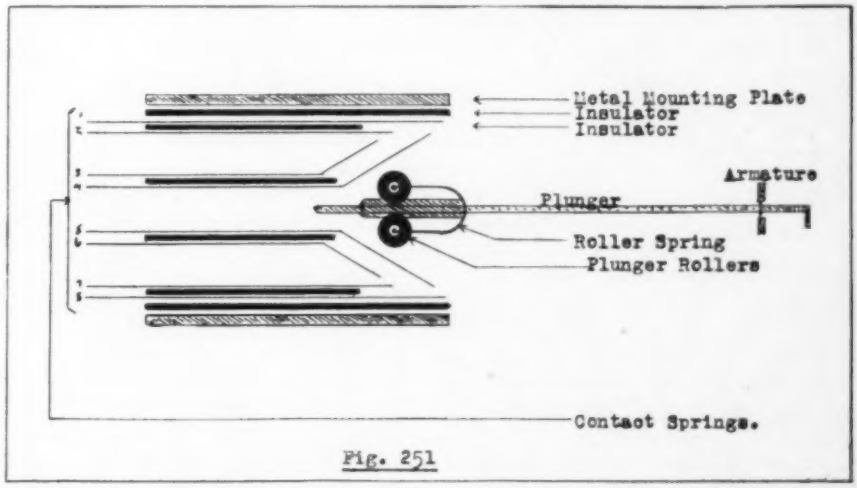


Fig. 251

8. "B" relay pulls up and grounds armature, closing circuit to the B. C. O. coil.

9. B. C. O. coil holds plunger armature and B. C. O. armature operated, closing bank contacts, and opening B. C. O. springs.

10. Line relay armature releases, and opens circuit to the 45-ohm pull down coil.

Subscriber now finds a balanced battery feed, which gives him a quiet line, but has not yet operated his dial to call a number.

The similarity between the two operations is quite evident. The subscriber in the first instance has not given the number required with his lips, and in the latter case he has not given his number with his dial or calling device.

Trunks

The operators' cord circuits can be called trunk circuits because they are used as common paths for telephone traffic between telephones. The lines between the line switch banks and the selectors or connectors are also trunks because they are used as common paths for a number of telephones.

In Fig. 252 is shown an assembly of 10 sets of springs such as shown in Fig. 251. These are arranged in groups of 10. The plunger is shown pivoted to the pull down plunger armature. This allows the line switch plunger to swing before any one of the 10 sets of springs. Connected to each set of springs would be a set of wires corresponding to the cords of a manual switchboard. Each cord has three conductors, tip ring and sleeve. The three wires from the line switch bank are called the negative, positive and release or private trunk. *The release trunk* is now the most common

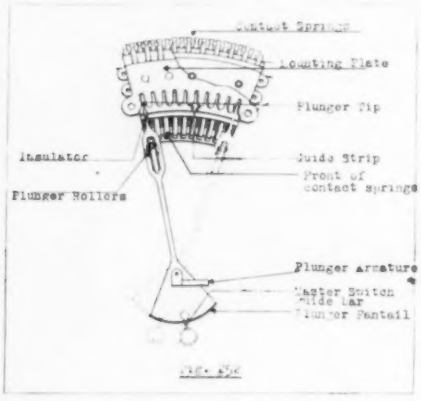


Fig. 252

name. There is a fourth set of wires provided for but we will not have any use for them for a while.

There is a slot in the fantail portion of the line switch plunger. In Fig. 252 and 254 it will be noticed that the slot is filled with a projection from a piece called a master switch bar. This bar is moved by another piece of apparatus called a master switch. Its purpose is to move all line switch plungers away from a trunk that is in use. In Fig. 252 the plunger is shown facing No. 1 trunk, and also the dotted lines show how it would appear facing No. 10 trunk. Naturally the plunger could be placed in front of any one of the 10 trunks. Therefore if the master switch bar was to move from left to right as in Fig. 252 and 254, the line switch plunger would swing with it since the projection from the master bar is engaged in the slot of the fantail of the line switch plunger. If, however, the plunger should be pulled in as in Fig. 253, the fantail has moved away from the master switch bar and any movement of the bar will have no effect on that line switch. This means that if a subscriber has called a number, the line switch will be in and will not be effected by the master switch bar.

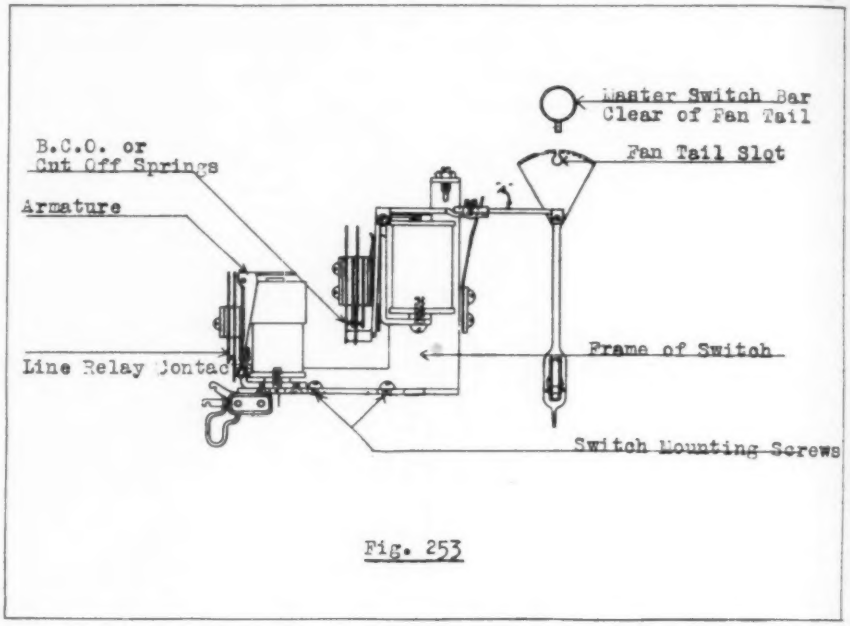


Fig. 253

Adjustments

The line switch in Fig. 254 is not operated. The same position is seen in Fig. 252. This means that the plungers are subject to motion of the master switch bar. Now in Fig. 252 the tips of the wipers are so set that they are clear of the points of the master switch guide strip. This adjustment is made with the plunger armature back stop adjusting screw as shown in Fig. 254. This screw is set back so that the tips of the plunger will not touch on the guide strip. The screw can be set in so that the tip of the plunger can be felt to touch on the tip of the guide strip, and then turned out again about one-quarter turn of the screw. This will give sufficient clearance between the plunger and the guide strip. The tip of the plunger must also stand opposite the center of the opening to the guide strip as shown in Fig. 252.

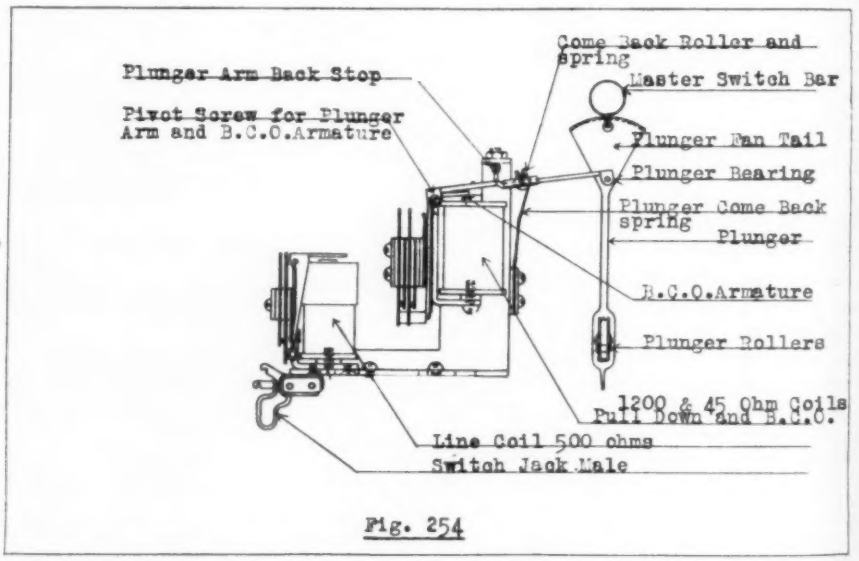


Fig. 254

This adjustment, however, must be taken up in conjunction with the Master Switch. However, we will just here draw attention to the importance of the

(*Continued on page 27.*)

LINE AND DESK

LOCATING TELEPHONE CABLE LEAKS BY AIR PRESSURE

The following article describes the equipment used in the air-gun or air pressure method of testing telephone cables. The outfit is used in locating holes or leaks in wiped joints and cable sheaths by means of air pressure. The outfit consists of a case containing a calcium chloride cylinder, a pressure gauge, a cylinder containing a spare charge of calcium chloride, a small gimlet, a soap container, a brush, a section of hose fitted with a chain clamp, and a hand pump.

In the days when the failure of a 50-pair cable meant considerable excitement, hurried calls were placed to the cable maintenance people in order that they might restore service with the greatest possible dispatch. However, with the steady progress in the telephone art, the size of cables has increased to the point where cables carrying 1,212 pair of wires are numerous. The inconvenience to the customers which would result from the failure of one of these large telephone cables can be appreciated when it is considered that many of these individual pairs often serve as trunks, either between central offices or from central offices to private branch exchange switchboards.

The failure of one of these large cables is therefore a serious matter, and regardless of how prompt the cable maintenance people may be, such a failure would cause considerable inconvenience to the telephone company's customers. For this reason the cable maintenance people direct their major efforts toward preventing cable trouble rather than repairing trouble after it has been allowed to occur.

Until a few years ago there was no means of successfully detecting cracks or obscure openings in the sheath of cables, and therefore failures were not uncommon during the rainy season. Having been brought into contact with this annoying condition on many occasions, C. A. Erath, supervisor of cable maintenance of the Pacific Telephone and Telegraph Company in San Francisco, set about to devise a method whereby these hidden sheath breaks might be detected before they actually caused trouble.

Th idea was conceived of pumping air into the cable through a hole which could be purposely made in the sheath and afterwards sealed when the test was completed.

However, before this was practical it was necessary to overcome the additional problem of taking all moisture out of the air which would be pumped into the cable, as even a trace of moisture would seriously affect its serviceability.

This problem was overcome by first passing the air under pressure through a small cylinder containing calcium chloride. The calcium chloride absorbs the moisture in the air before it is passed on into the cable, and therefore must be replaced periodically as it becomes saturated.

In order to prevent any of the calcium chloride granules entering the cable, the granules are enclosed in a wire screen of fine mesh. When it is desired to test a cable, a small hole is made in the sheath by means of an auger. A hand pump is then connected to one end of the calcium chloride tank, and the cable to be tested is connected to the other end of the tank by means of a hose and connections. Air is then pumped through the calcium chloride tank and into the cable, the gauge indicating the pressure within the sheath. If a sheath break exists, either in the visible portion of the cable or some place in the underground duct, the air which escapes through this break can be distinctly heard.

A container and brush are used to coat the cable with a film of wet soap, which greatly aids the detection of a break by causing a bubble at the point of the break when air is forced into the cable.

Numerous sheath breaks which could not be located by other means, and which probably would have caused trouble, have been detected by use of the air gun devised by Mr. Erath.—Contributed by C. W. Geiger.

THOSE GOOD OLD DAYS

In clearing toll line trouble we would travel by train to the town nearest to where the trouble measured, then hire a horse and buggy at the local livery stable and light out after the trouble. Sometimes we would find the trouble back in the mountains just at dark, and after getting a clearance from the wire chief, we would then drive twenty miles back to where we hired the horse and buggy, and catch a midnight train back to the city, often arriving home at 2 or 3 a. m., and be back on the job next morning at 7 a. m. Overtime was unknown, and then, as now, a lineman's creed was, "Get the trouble clear," as quickly as possible. I well remember how the lineman back in those days would work out in the rain and then get into one of those old open, springless wagons and drive eight or ten miles to the boarding house.

It seems like a dream to us old timers as we look back to the days of the horse, mule and wagon, days when they spoke of the automobile as a horseless carriage, and as something only the rich could afford to buy. And yet it has all come to pass, and we have lived to see the telephone company change its mode of transportation from the old mule named "Maude" to the modern automobile manufactured by Henry, and we are glad that we live in an age where the working man and his family are able to enjoy riding in what we used to call a horseless carriage and thought would never be practical.—Harry Singler in Southern Telephone News.

TRANSATLANTIC TELEPHONE CABLE

Last year the American Telephone and Telegraph Company announced that the Bell Telephone Laboratories had perfected a deep sea telephone cable suitable for transatlantic operation. Work is now going forward actively on the development of a cable system of this type for connection between London and New York City and it is possible that this circuit will go in service as early as 1932. While the new cable will yield only a single telephone circuit, this will be one of maximum reliability, free from the variations characteristic of radio circuits. It is not the idea that the cable will replace radio circuits but it will add considerably to the reliability of New York-London service as well as adding to the total message capacity.

The route of the cable is not settled in detail, but it is probable that the main transatlantic link will extend directly from Newfoundland to Ireland, a cable length of approximately 1800 nautical miles. From Newfoundland it is expected that the circuit will be carried through several sections of submarine cable to Nova Scotia; thence by land circuits through Nova Scotia, New Bruns-

wick and the New England states to New York City, where it will terminate. From Island the circuit will probably be carried through submarine cable to Scotland and thence by land cable to London, which will be the other terminal.

The new cable will be of the continuously loaded type. For the loading material, it is planned to use one of a new series of alloys which are designated as "perminvars." These are composed of nickel, cobalt and iron, to which may be added small amounts of non-magnetic metals such as molybdenum. They are characterized by high resistivity and by having a constant permeability over a wide range of magnetizing force.

The conductor will be insulated with a new material "paragutta." Submarine cables in the past have been insulated with gutta-percha or closely related materials, and in a few cases with rubber compounds. Paragutta makes use of similar raw materials, but so combined and treated as to give superior electrical properties with mechanical properties similar to gutta-percha.

A remarkable feature of the cable is the high attenuation which it is proposed to use. It is possible that successful operation can be obtained with an attenuation of approximately 150 db. for the high frequencies of the voice range. This is a much greater attenuation than that at which telegraph cables are operated. Such a high attenuation depends on two features of the cable; the characteristics of perminvar are such that a relatively high sending level can be used, and by means of special construction the cable will be shielded against interference so that a very low receiving level can be employed.

To make two-way operation possible, voice-operated switching mechanisms will be required at the two terminals. These devices will permit the circuit to be operated only in one direction at a given time, this direction of transmission, however, being automatically controlled by the speech waves of the two talkers so that conversations may be carried on in a perfectly natural manner.—A. J. E. E. Journal.

USING PRE-CAST MANHOLES

To some of the old-timers in the business, the use of manholes cast in the yard and hauled to job may seem like the old jokes about hauling out a load of poleholes and driving them down or of sending the new ground man back to the truck for a bundle of dead-ends. However, the precasting of manholes is actually being done according to a writer in a recent number of Southwestern Telephone News and he verifies his statements by showing pictures of a yard full of manholes and a truck towing a trailer with two of the manholes.

According to the writer, the wooden forms are filled with concrete and when the proper interval for setting has gone by, the form is knocked away and a complete manhole with entrance slots for the conduit and other necessary openings, stands ready for placing. These huge concrete cubes which weigh from five to six and a quarter tons are then hoisted on trucks and carried to the point where they are to be lowered into the trench system.

Two types of pre-cast manholes have been developed for the Joplin-Carthage line. Type A, of which there are fifty-two, has an inside dimension of eight by three and a half feet with a head room space of five feet six inches. It is cast in one piece and is the heaviest type. Type B, of which there will be ninety, is also cast in one piece. Inside it is three by six and a half feet with head room space of five feet six inches. It is lighter than Type A.

Both types have five inch reinforced concrete walls with four-inch reinforced floors and six-inch reinforced roofs. They are carried to the job on a ten-ton trailer. One type A or two of the smaller type are carried at a time. The motive truck has a power crane for placing them.

The crane of the motive truck is equipped with a clamshell bucket and it is capable of digging the hole for a type A block in a little more than an hour, unless of course rock is encountered, making the use of dynamite necessary.

HIS BACK'S HIS WEAKNESS NOW

Old "Bim" Jones was a good old soul,
A good old soul was he.
He avoided "bum" ladders, leaning ones, too,
And worked most times, carefully.

But "Bim" had one weakness, a bad one it was,
And it finally got him, too,
He never examined the scaffolding he used,
And finally one let him through.

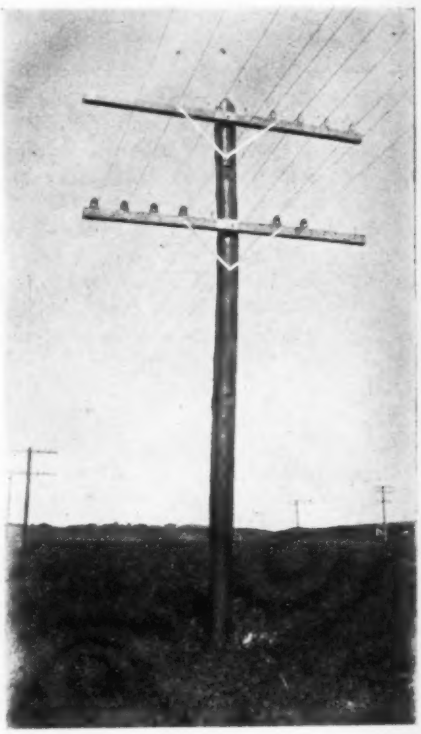
Now the I. B. T. has some good old souls,
Yes! good old souls, hey! hey!
So examine all ladders and scaffolding, too,
Then they won't make a "Bim" out of you.

—*Bell Telephone News.*

Creosoted Southern Pine Pole Line Installed in North Dakota

Creosoted southern pine poles were utilized recently by the Northwestern Bell Telephone Company in the construction of something over 40 miles of a 70-mile telephone line in the extreme western part of North Dakota. This line, which has as its western terminus the town of Beach, located on the Montana-North Dakota boundary line, extends eastward generally along the route of the Northern Pacific Railway to Dickinson, North Dakota.

On that section of the line from Dickinson to Medora construction is new and all poles used were creosoted pine, while from Medora west poles were only replaced where the untreated poles formerly installed had decayed and were no longer serviceable. These replacements were, however, made with creosoted poles of the type used in the new construction further east.



These Creosoted Southern Pine Poles Were Gained Before Treatment for Additional Crossarms to Provide for Increased Wire Loads.

The poles are all 20 ft. in length, with a butt circumference of approximately 30 in. and a top circumference of 21 in. They are set to a depth of 4½ ft., leaving about 15½ ft. above the ground line.

They are at present equipped with two 10-pin crossarms and are carrying a 10-wire load. All framing and boring was done before treatment, and gains have been provided for additional cross-arms which may be added in the future as occasion may demand. Poles are set at intervals of 130 ft., or 40 poles to the mile.

All poles were treated by the full-cell process in accordance with specifications of the American Wood Preservers' Association, receiving an absorption of 12 lbs. of Grade One coal-tar creosote per cubic foot, which should give ample decay protection.—*Wood Preserving News.*

Remote Control Features Hopewell Installation

Virginia Exchange of 900 Lines of Strowger Equipment to Be Entirely Unattended at Night. Power and Ringing Equipment Can Be Tested and Operated Over Trunks from Petersburg, Fourteen Miles Away

By ROY OWENS

Sales Engineer, Automatic Electric, Inc.

One of the most important features of Strowger Automatic Dial telephone equipment is its extreme flexibility. This point has been often touched upon in various articles, describing the many unusual services which have been furnished in different localities by combinations of standard Strowger switching units and slight changes in circuit design. Not only can all kinds of telephone services be furnished economically with standard Strowger equipment, but the power apparatus which furnishes power to operate the exchange and the ringing sets which supply the ringing currents of different codes can also be tested and controlled from a distance, using standard Strowger switches for the purpose. The various mechanical "robots" which have attained to so much newspaper publicity of late, do little that is not being done in many cases by the various remote control arrangements which have been incorporated in Strowger Automatic Dial exchanges in different parts of the country.

What is more, the remote control arrangements for power and ringing equipment in Strowger Automatic Dial exchanges are no publicity stunt, but are carefully worked out plans to meet specific operating requirements of the telephone company. One of the most interesting remote control installations which has been made recently is at Hopewell, Va., where provisions have been incorporated in the exchange plans to meet certain operating requirements as desired by the Petersburg Telephone Company, whose headquarters are at Petersburg, Va.

In this case it was desired to operate the Hopewell exchange, consisting of 900 lines of Strowger Automatic Dial equipment, as an attended exchange during the day, and on an unattended basis during the night. During the night period all information and special services are to be handled at Petersburg, fourteen miles away, which is manually operated. Also the power and ringing equipment will be under the control of Petersburg during this period. The following article will describe the remote control operation and show how completely all of the requirements relating to the remote control have been met with standard Strowger equipment.

Hopewell will have 900 lines of line finders, a line I.D.F. and 1,200 connector terminals. During the day it is to be operated as an attended automatic exchange, the information and special services being handled locally. The supervisory alarms will be confined to the Hopewell office during the day, and power and ringing control will be handled by an attendant.

About one-half mile from the Hopewell exchange is located the extensive plant of the Atmospheric Nitrogen Corporation. For the use of this organization a 130-line Strowger P-A-X (Private Automatic Exchange) is provided, with a two-position attendant's cabinet. Eight two-way trunks will be furnished between this P-A-X and the Hopewell exchange, arranged so that certain of the P-A-X users may dial anyone in Hopewell direct, without the intercession of the attendant. The P-A-X attendant's cabinet, however, shows visual lamp signals which indicate how many of these trunks are in use at any time. Also, anyone dialing the Atmosphere Nitrogen Corporation's number will come in on the attendant's cabinet over one of these eight trunks, and the attendant will complete the connection to the desired inside telephone. P-A-X telephones, which are denied direct dialing facilities to Hopewell, can come in to the attendant's cabinet through one of thirteen one-way trunks, where one of the attendants will complete the outside connection for them, recording it if required. The P-A-X has facilities for remote control of power and ringing equipment, which will be described later.

From the Hopewell exchange to the Petersburg exchange fourteen miles away the following trunks are provided: Eight one-way physical trunks, two two-way physical trunks, and four two-way phantom trunks. During the night, when the Hopewell exchange is unattended, the regular staff of operators at Petersburg will handle information and special services for Hopewell over these trunks. In addition, the supervisory alarms are arranged so that they may be extended to the Petersburg office if desired while the Hopewell office is unattended. A special feature is provided whereby, even though a key provided at the Petersburg exchange is not thrown to extend the alarms into the distant office alarm equipment, a case of exchange battery failure at Hopewell will automatically seize a trunk and bring in a permanent signal at Petersburg.

The power equipment at Hopewell consists of a motor-generator set rated at 25 amperes, 50 volts. Provision is also made to permit taking charging current from a rectifier. The float scheme of charging is used, with automatic voltage control by means of end cells. The end cells are the same as the regular cells except that they are arranged to be automatically cut in or out of the discharge circuit as required, all three being switched at the same time. The end cell switch is under the control of the high and low voltage relays which cause the end cell switch to cut in the end cells when the voltage falls below 46 volts and to cut out the end cells when the voltage rises above 52 volts. In case the voltage falls below 46 volts after the end cells are cut in or rises above 52 volts after the end cells are cut out, an intermittent alarm will be brought in until the voltage is corrected. In case the end cell switch fails to function properly, a continuous alarm is brought in.

For distant office supervision a test connector is provided at Hopewell. It is arranged so that its rotary motion can be stepped one step at a time under the control of a dial at Petersburg (or locally, if desired) to permit testing for signals and operating the ringing machines and the distant office alarm by remote control. For instance, dialing 14121 gives the condition of the Hopewell exchange voltage. If the exchange voltage is above 52 volts or below 46 volts an intermittent generator tone will be heard. If the exchange voltage is within the above limits an uninterrupted generator tone will be heard. Absence of a signal indicates trouble. Next dialing the digit 1 steps the test connector to the second rotary bank contact of this level which is

14122, which gives the position of the automatic end cell switch. If the end cell switch is on the 23-cell position dial tone is heard, while if it is on the 26-cell position, a busy tone will be audible. In a similar manner subsequent dialing will return other signals and perform operations which will be listed in detail below.

The ringing machines are furnished in duplicate, each being a 20-cycle dynamotor complete with high speed busy and dial tone commutator and interrupter for code and straight line ringing. Manual control keys are provided on the power board at Hopewell for switching these machines in or out of service. By throwing the ringing machine control key toward the remote control position, the switching of the ringing machines is made available for remote control service from Petersburg (or locally, if desired). Provision is made for both local manual control and remote control in the switching of the ringing machines, so that no incomplete codes are sent out; the remote control is also so arranged that the ringing machine in service can only be taken out by switching in the idle machine, thus insuring a continuous supply of ringing current at all times. The actual digits which must be dialed for controlling ringing remotely will be listed below.

Supervisory alarms are extended to Petersburg (when so desired, usually at night only) over a phantom trunk. This trunk may be seized for this purpose by remote control from Petersburg (or locally, if desired). A manual key is then also thrown at Petersburg which connects this trunk with distant office alarm equipment in the Petersburg office. This trunk can also be tested by remote control to see whether or not it is being used for supervisory purposes, or whether it is available for regular toll use. By dialing 14191 over the test connector a code 1 (one ring) ring-back tone indicates that the trunk is being used for transmitting Hopewell supervisory alarms to Petersburg. If a code 2 (two ring) ring-back tone is heard, it indicates that the trunk is free and available for regular toll service. If the trunk is being used for supervisory purposes, and is desired for toll service, it can be released from the former by remote control.

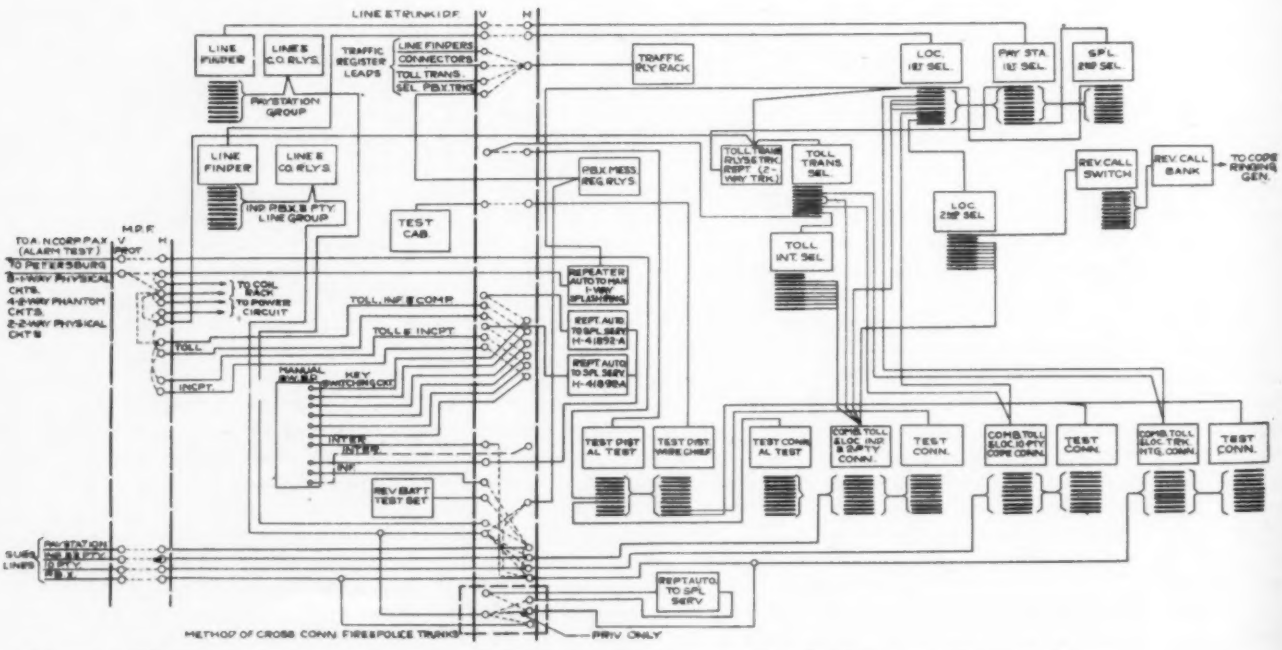
The different numbers which may be dialed on the test connector by remote control and the functions which they perform are listed below:

14121 Test for voltage alarm.
14122 Test for end cell switch position.
14123 Test for power board fuse alarm.
14124 Test for ringing machine No. 1 generator off.
14125 Test for ringing machine No. 2 generator off.
14126 Test for ringing interrupter alarm.
14127 Test for automatic equipment fuse alarm.
14128 Test for automatic equipment release alarm.
14129 Test for M.D.F. alarm.
14120 Test for supervisory alarm.
14131 Test for generator 1.
14132 Test for generator 2.
14133 Test for generator 3.
14134 Test for generator 4.
14135 Test for generator 5 and code 1.
14136 Test for code 2.
14137 Test for code 3.
14138 Test for code 4.
14139 Test for code 5.
14141 Test for busy tone.
14142 Test for dial tone.
14151 Test for operation of ringing machine 2.
14152 Cut in R.M.1 and R.M.2 out and test for operation of R.M.1.
14153 Test for operation of R.M.1.
14161 Test for operation of R.M.1.
14162 Cut in R.M.2 and R.M.1 out and test for operation of R.M.2.
14163 Test for operation of R.M.2.
14191 Test for alarm trunk in.
14192 Clear alarm trunk and test.
14193 Test for cleared alarm trunk.
14101 Test for alarm trunk out.
14102 Cut in alarm trunk and test.
14103 Test for cut in alarm trunk.

These various tests are similar to the two described previously, in that predetermined tones are heard by means of which the complete condition of the Hopewell exchange can be readily ascertained at any time by an operator at Petersburg. If any of the ringing codes or tones do not test back properly, the ringing machine in operation can be cut out and the duplicate set cut into operation by remote control, to remedy the trouble.

The Strowger P-A-X at the plant of the Atmospheric Nitrogen Corporation is also provided with remote control facilities, but owing to the smaller size of the installation, and a difference in the design of its charging equipment, the provisions for its satisfactory operation by remote control differ somewhat from the above. The difference is best shown by a list of the remote control operations possible by dialing certain digits either from Hopewell or Petersburg (or locally, if desired). This list is as follows:

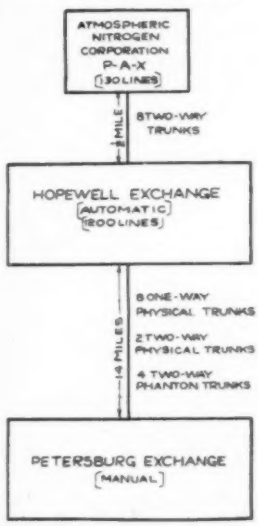
15121 Test for voltage alarm.
15122 Test for charging switch position.
15123 Test for power board fuse alarm.



Schematic Diagram Showing the Operation of the Strowger Automatic Dial Equipment at Hopewell, Va.

15124 Test for ringing machine No. 1 generator off.
15125 Test for ringing machine No. 2 generator off.
15127 Test for automatic equipment fuse alarm.
15128 Test for release alarm.
15129 Test for M.D.F. alarm.
15130 Test for supervisory alarm.
15131 Test for interrupted generator 1.
15132 Test for interrupted generator 2.
15133 Test for interrupted generator 3.
15134 Test for interrupted generator 4.
15141 Test for busy tone.
15142 Test for dial tone.
15151 Test for operation of ringing machine No. 2.
15152 Cut in ringing machine No. 1 and ringing machine No. 2 out and test for operation of ringing machine No. 2.
15161 Test for operation of ringing machine No. 1.
15162 Cut in ringing machine No. 2 and ringing machine No. 1 out and test for operation of ringing machine No. 2.
15171 Test for charging switch position.
15172 Start charging.
15181 Test for charging switch position.
15182 Stop charging.

All of the equipment involved in the special remote control facilities for both



Schematic Diagram Showing Relationship of the Petersburg Exchange, the Hopewell Exchange and the Atmospheric Nitrogen P-A-X.

the Hopewell exchange and the P-A-X at the plant of the Atmospheric Nitrogen Corporation, consists of standard, time-tried Strowger units. Where the conditions of operation are such that it is desirable to shift the supervision and control of a Strowger Automatic Dial exchange to some nearby operating center during certain periods, such as at night when it is to be unattended, telephone companies find these simple and positive remote control facilities extremely useful.

Studying Telephone Methods, By E. R. Collins

(Continued from page 22.)

position of the plunger tip in relation to the entrance to the guide strip.

Another adjustment which is quite important is to see that the position of the plunger tip in relation to the Bank Springs as shown in Fig. 251 is exactly midway between both sets of springs. This will give an even pressure on both rollers and will reduce friction. This adjustment also prevents the plunger tip from rubbing on the upper or lower guide surfaces when entering the guide strip.

The Line switch frame is fastened to the Line Switch Upright frame with machine screws. After the screws are tightened slightly, the position of the line switch either up and down or sideways can be altered. This is best done with a driver and a hammer. A very slight movement of the switch can be obtained in this way, whereas trying to set it by hand when the screws are loose is quite difficult.

The line switch plunger must be pulled out when the line is released. This is accomplished by the come back roller and spring. This is shown in Fig. 254. The tension of this spring must be sufficient to overcome the friction of the line switch bank springs on the plunger rollers, and yet not too stiff to prevent the pull down coil from pulling the armature in.

If the line relay armature should remain operated, the 45 ohm pull down coil will become overheated. Indication of such a condition is given by a system of alarms. The inner surface of the armature can be cleaned by pulling a piece of twill tape between the core and the armature. If this is not effective, a residual screw may be set in the armature and adjusted so as to prevent sticking, but not prevent the line coil holding the plunger in until the release trunk is grounded from the "B" relay of the connecter or selector connected to such trunk. In the next chapter we will discuss the assembly of lines switches in groups, and take up the study of the master switch.

Fort Wayne, Ind., Promotion

Announcement that Miss Louise Pohlmeyer, traffic supervisor for The Home Telephone and Telegraph Company, Fort Wayne, Indiana, has been appointed supervisor of all manual operation both in and outside of Fort Wayne, has been made by Earl L. Gaines, traffic superintendent.

Miss Pohlmeyer will retain her title of traffic supervisor, but will discharge the duties formerly discharged by the supervisor of traffic. That title has been discontinued.

Miss Pohlmeyer is a veteran employe of the Fort Wayne Company. Her employment dates from 1904 when she was hired as an operator at the old south offices of the company. In a short while she became relief chief operator at the South office and after that chief operator at the same office.

In 1922 Miss Pohlmeyer was transferred to the main office of the company as chief operator. She held that position until 1925 when the Fort Wayne telephone plant was converted to automatic. At that time Miss Pohlmeyer was made traffc supervisor.

New Telephone System Completed

Jerseyville, Ill.—Hardin's new underground telephone system was cut into service last week. Approximately five thousand feet of underground cable has been installed in the confines of the village.

American Telephone & Telegraph to Erect Irish Station

(Special Cable to The New York Times)

London.—A $200,000,000 scheme for the establishment of a transatlantic cable telephone service has been advanced by the purchase by the American Telephone and Telegraph Company of a site at Blacksod, near Ballina, Ireland, for the erection of a terminal receiving station. The scheme will provide the first telephone cable from New York to London. The radio telephone is already working, but is regarded as too costly.

New Exchange at Dorchester

Dorchester, Neb.—The new telephone building and central office equipment of the Lincoln Telephone and Telegraph Co. was placed in service at Dorchester August 18.

The new building is a one-story structure of brick and stucco, trimmed with colored tile, located one block north of the main business corner of town. The interior is finished in the latest design. The building is modern and fireproof. The front room houses the commercial office, lobby, public telephone booth and switchboard room. The equipment room and operators' rest room occupy the rear of the structure.

A new two-position common battery switchboard of the latest type replaces the old magneto board and equipment. C. H. Haberman is manager of the exchange.

Enough telephone wire to girdle the earth twelve times has been added to the Bell telephone lines in the Canadian provinces of Ontario and Quebec during 1928.

Telephone Transmission

Second Installment of This Article, Furnished by Mr. B. C. Burden of the Lincoln Telephone & Telegraph Company, Furnishes Some Interesting Information on This Subject

(*Continued from August issue*)

The New TU Unit

A new unit known as the "TU" was introduced during 1924, which replaced the 800 cycle mile unit, which had itself been introduced to replace the m. s. c. unit.

The principal reasons for establishing a new unit to replace the "800 cycle mile" unit were as follows:

1. The "800 cycle mile" unit was based on Napierian Logarithms, which made it difficult to show the relations between various numbers of the unit. The "TU," being based on common logarithms, enables an easy expression of the relationship between any number of units.

2. The new unit was based on a 1,000 cycle measuring frequency, as it was found that 1,000 cycles more nearly approximated the equivalent effect of the human voice than does 800 cycles.

The new TU unit was selected so that it would represent approximately the same attenuating effect as a m. s. c. or the 800 cycle mile. This fact is fortunate as it saves us from having to form entirely new conceptions of a transmission unit.

When we think of a TU we merely need to remember that it is 5½% larger than the former 800 cycle mile unit, or 6% less than the early m. s. c. unit.

The standards set up for local and toll plants remain the same for the TU as the other units, viz:

Local .....20 T. U.
Toll .....30 T. U.

Mathematically, the efficiency of a circuit in terms of the new TU unit is expressed by the following formula:

$$N = 10 \log \frac{p}{p_1}$$

Which reads as follows: The number of TU's loss or gain in a circuit is equal to ten times the common logarithm of the ratio of the input power "p" to the output power "p_1." If the current ratios are known, the TU's can be determined by the following formula:

$$N = 20 \log \frac{I}{I_1}$$

Which reads: The number of TU's corresponding to a loss or gain in a circuit is equal to twenty times the logarithm of the current ratio of the input current to the output current.

After reading these formulas for determining the number of TU's equivalent of a circuit, the question will immediately arise, "How can I apply these formulas to my plant?" The answer is that ordinarily you can't, nor is it necessary.

The currents that pass over telephone lines are extremely minute, and to attempt to measure the current at the input and output ends would require delicate measuring instruments and considerable care to make sure that the current was being measured under identical conditions at both ends. The above formulas are useful to most of us as something merely explanatory of what a TU is.

As practical telephone people, we should, however, become familiar with the transmission equivalent of cable, open wire, and apparatus efficiencies. This information is available in tabular form in many telephone books. We should also familiarize ourselves with the various transmission measuring arrangements, and will then be in shape to properly administer the transmission problems of our telephone plants.

Transmission Equivalents

The table given in Table 1 gives the transmission equivalents of some of the most common types of outside telephone plant.

It is apparent from the table that unloaded cable must be used with a certain amount of caution on long cable extensions as the transmission equivalent of the smaller gauges is rather high.

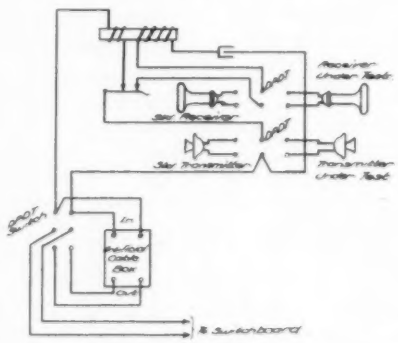


Fig. 4—Transmitter and receiver testing arrangement

There are few, if any, small telephone plants but that can utilize 24-gauge cable entirely in their city plant. It is only on long extensions into the rural districts that transmission trouble might be encountered.

Transmission equivalents represent the relative attenuating effect of the lines and apparatus for which they stand upon the high frequency voice currents. It might seem that by merely adding up the respective transmission equivalents of all the circuits and apparatus involved in a transmitting and receiving connection that the over-all loss of the set up would be obtained. This *is not true*, however, as there are other factors that make computation of the over-all transmission between transmitting and receiving subscriber more difficult. In the first place, we must consider the instrument efficiency. For example, when we say the transmission equivalent of 22-gauge cable is 2.05 TU, we mean that it will attenuate the voice currents through it so that the receiver volume will be the same as that obtained in the standard reference circuit with approximately 2.05 m. s. c. cut in. But if we are considering the transmission over a mile of 22-gauge cable when connected to certain type instruments and switchboard, we may actually get a received volume greater than that we would get in the standard reference circuit with 2.05 m. s. c. cut in. This might mean that we were using a subset battery supply of higher efficiency than that used in the standard reference circuit. This higher efficiency is equivalent to a gain in transmission, and while the transmission equivalent of the cable would still be 2.05, the over-all transmission of the entire talking circuit might be less than the equivalent of the cable.

For example, if the instrument used was 1 TU better than the old standard reference subset, then the actual loss of the circuit would be 2.05 minus 1 or 1.05 TU over-all equivalent.

Manufacturers can, and are generally willing to, furnish transmission equivalent data on their apparatus. The difference in efficiency between various makes and types of transmitters is surprising.

Most present day transmitters are from 3 to 4 TU more efficient than those put out five to ten years ago. Receivers have also been improved so that the best type receivers available today are 2 TU better than the older types.

Switchboard repeating coils have been made more efficient until good coils with a loss of only .25 TU are available, whereas from 2 to 3 TU loss in the older coils was not uncommon.

Transmission Loss Components

In addition to instrument efficiency which would tend to make transmission better or worse than indicated by the transmission equivalents of the outside

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plant, we also have other factors which must be taken into account. For example, there are three losses on a common battery subscriber's loop which are:

1. Battery supply loss.
2. Reflection loss.
3. High-frequency loss.

The battery supply loss is caused by the drop of potential in the conducting medium, and is proportional to the resistance of the subscribers' loop.

Reflection losses are due to mismatched impedances, i. e., it is a fundamental law that a maximum power transfer between two unlike conducting mediums will take place only when the impedance of the two mediums match. There is, therefore, a slight loss from this source. Reflection losses may be quite large at the junction of two radically different mediums, such as open wire and unloaded cable. Fortunately, for ordinary exchange and rural plant transmission considerations, we can, without a large error, forget about reflection losses.

The most important loss we have to deal with in telephone transmission is the high frequency loss. This does not mean that the current supply loss is not also important, but we can always bolster this loss up on long loops by local batteries and other means.

It should be remembered that "transmission equivalents" indicate *only* the high frequency loss.

No general rule can be given for determining the current supply loss as this depends upon the characteristics of the transmitters used as well as the resistance of the subscribers' loop.

The losses on local battery subscribers' loops are composed of the high frequency loss and the reflection loss. Neglecting reflection losses, the high frequency equivalents are, therefore, a fairly approximate index of the transmission to be expected, assuming the efficiency of the subsets to be considered are at least as good as the standard reference subset.

Transmitters and Receivers

The efficiency of different makes of transmitters varies greatly, and, likewise, the efficiency of the same make are not always uniform. Transmitters can be tested for energy output, noise (frying), side tone, articulation and packing.

The best method for testing transmitters is by talking tests and the use of an artificial cable or "receiver shunt." Talking tests enable a check of noise and articulation, as well as a comparison of the volume output to that of a new or standard transmitter. Tests of this type can be conveniently made on the repair bench by arranging a subset which is known to be perfect on a test panel. The transmitter of this subset is connected to a 2 pole-double throw switch as shown in Fig. 4. A suitable cradle is arranged on the test panel to hold the transmitter under test which is connected to the double pole double throw switch by means of flexible leads and test clips. The double pole double throw switch permits connecting either the standard or the transmitter under test to the subset. A second double pole double throw switch is mounted at the side of the first one and connected to the subset, as shown in the figure, so that the artificial cable is in circuit when the standard transmitter is connected to the subset and out of circuit when the test transmitter is connected. The line is extended from the test panel to the m. d. f. and there connected to a vacant switchboard line.

In operation, the tester connects the transmitter to be tested to the test clips and then removes the receiver to signal an operator. In the smaller exchanges the chief operator is generally available to give assistance when it is desired to make a test. The operator is asked to observe the difference in volume between the standard transmitter, called No. 1, and the transmitter under test, referred to as No. 2. The tester counts in an even voice, saying 1, 2, 3, 4, etc., talking first over No. 1 and then over No. 2. The chief operator reports No. 1 or No. 2 stronger, as the case may be. The

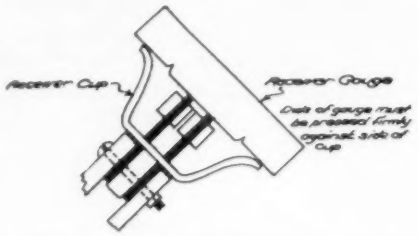

Fig. 5—Gauge for checking receiver air gap

tester then cuts in artificial cable in series with the subset line (when connected to the standard transmitter), and adjusts until the volume, as noted by the chief operator, is the same over both transmitters. The loss in transmission of the transmitter under test as compared to the standard transmitter is indicated by the number of miles of standard cable in circuit.

In case the transmitter under test is better than the standard transmitter and it is desired to know how much better, then the d. p. d. t. switch No. 2 should be thrown so as to insert the artificial cable in series with the line when talking over the transmitter under test.

Receivers are not as subject to as much trouble as are transmitters. A mechanical check of the air gap and diaphragm condition and a test of the permanent magnet is generally a sufficient and accurate means of determining receiver efficiency.

The air gap between diaphragm and pole pieces should be .00015 in. The proper method of checking this gap is by means of a receiver gauge similar to the one shown in Fig. 5. The gauge is placed on the receiver, as shown, and moved across the pole pieces. If the gap is correct, the gauge will just touch the pole pieces. The pole pieces in some receivers are adjustable, and in most receivers an adjustment is possible, due to the play in the assembly that clamps the

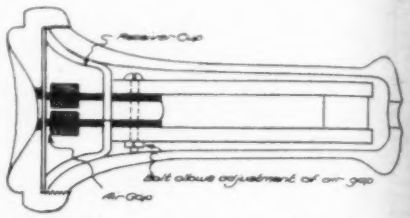

Fig. 6—Sketch showing receiver air gap adjustment

pole pieces to the permanent magnet. This is shown in Fig. 6. A small variation in the air gap results in a large loss in receiving efficiency. Bent diaphragms are easily noted, and should be discarded rather than an attempt made to straighten them.

Weak magnets have a very detrimental effect on the received volume, and should be either recharged or the receiver replaced. The strength of the magnet can best be tested by its ability to support a soft iron weight. The proper size weight to use can readily be determined by experimenting with various weights on a new receiver. A magnet should be able to support its own diaphragm on edge without difficulty, as shown in Fig. 7.

If it is desired to make receiver tests in terms of m. s. c. units or TU's, an additional double pole double throw switch should be placed on the test panel and wired as shown. Tests are made by having the chief operator count and then listening alternately over the standard receiver and the receiver under test. Artificial cable is cut into the line with the standard receiver in circuit until the volume received over each receiver is the same. The loss of the receiver under test is then equal to the amount of artificial cable cut in.

Other Transmission Measuring Arrangements

The ideal method of measuring the quality or quantity of anything is by means of direct reading instruments. For example, power companies can measure the voltage supplied to consumers by merely connecting a voltmeter across the line at the customer's house and noting the dial reading. No preliminary or auxiliary steps are necessary as in transmission measurements on telephone circuits.

As was previously stated, the magnitude of the voice currents ordinarily transmitted over telephone lines is insufficient to operate ordinary voltage or current measuring instruments. It is possible, and in some respects feasible,

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to measure the relative transmitting ability of lines and apparatus by means of a "vacuum tube voltmeter," however. A vacuum tube voltmeter is an arrangement of vacuum tubes and a sensitive direct current milli-ammeter. A small voltage applied to the grid of the vacuum tube

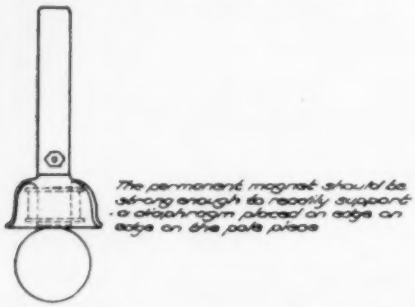

Fig. 7—Check of magnet strength

serves to control a relatively larger voltage in the plate circuit of the tube, and by means of the milli-ammeter in the plate circuit the voltage applied to the grid may be indirectly measured.

Vacuum tube voltmeters are a popular means of measuring the volume output of radio sets and the volume input applied to broadcast transmitters. They have several characteristics which make them somewhat impractical for general transmission measurements or comparisons. In the first place, they require a battery to light the filament of the tube or tubes, also a plate battery. This, of course, makes them somewhat more bulky than a regular transmission measuring set. Also, the indicating meter in the plate circuit of the meter is very sensitive to changes in grid or plate battery voltage, and hence it would be necessary to maintain these absolutely constant, otherwise the meter would give incorrect readings. Another difficulty is the necessity for matching the impedance of the input of the vacuum tube voltmeter to that of the line under test. Failure to do this results in a reflection loss which would give an inaccurate indication of the line equivalent. Where calibrated vacuum tube voltmeter methods are used, the a. c. input at the sending end of the line must correspond to that for which the meter is calibrated.

The vacuum tube voltmeter is an interesting piece of apparatus, and can be easily and cheaply constructed. Although the difficulties mentioned somewhat curtail its usefulness as a direct transmission measuring device for the small exchange, nevertheless it has many interesting possibilities around a telephone office.

For example, it could be used to obtain a relative comparison of instrument

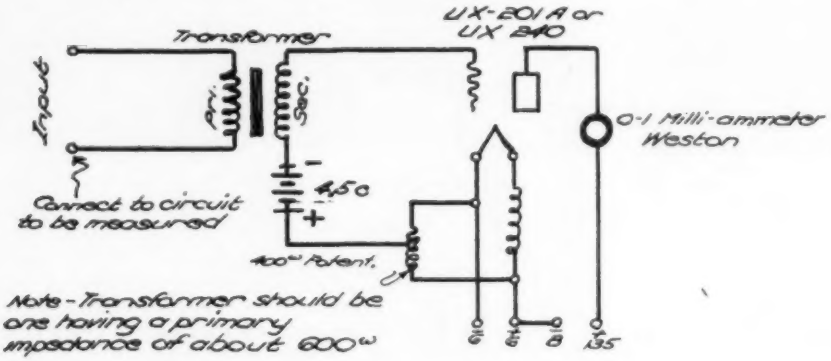

Fig. 8—Vacuum tube voltmeter

talking efficiencies, cord circuit efficiencies, etc. The three factors or objections just mentioned would be negligible when testing similar type or class of circuits at the same time. Of course, this type of test would necessarily be a relative one, that is, it would enable determining if apparatus was above or below some known standard. Fig. 8 suggests a layout that might be used for checking cords, transmitters, etc.

TRANSMISSION EQUIVALENT TABLE

Type Cct.	Resistance per mile	M. S. C. equiv.	800 C. M. equiv.	DB equiv.	Miles equivalent to 30 M.S.C.
No. 24 Ga. Cable....	274 ohms	1.93	2.16	2.05	15
No. 22 Ga. Cable....	171 ohms	1.65	1.84	1.75	18
No. 19 Ga. Cable....	86 ohms	1.19	1.34	1.27	25
No. 16 Ga. Cable....	46 ohms	.70	.79	.75	42
No. 104 Copper.....	12 ohms	.064	.071	.068	468
No. 109 Iron.....	64 ohms	.28	.31	.30	107
No. 803 Iron.....	112 ohms	.35	.40	.38	79

*The 19 gauge cable referred to above is the commercial type which has higher equivalent than the old mile of standard cable.

*The resistances and transmission equivalents are for a circuit mile.

Table I.—Transmission Equivalents of Outside Plants

A transmission set used by the Bell system companies utilized a sensitive meter in connection with vacuum tubes, but only as a balance indicator in place of the ear. The set referred to is known as the visual balance type to distinguish it from the 1-A or ear balance type. Measuring sets of the direct reading type are being used to some extent for measuring characteristics of toll lines in connection with program service work.

The TU Now Known as the DB

At the time the TU was set up, no suitable name could be thought of so it was given the initials of that which it represented, namely, the transmission unit. This has led to some confusion when speaking of transmission units, as it is not readily apparent whether the speaker refers to units in general or specifically to the TU. It was announced the first of the year (1929) that the TU had been renamed the DB or Deci-bel. This name was adopted in honor of Alexander Graham Bell. So remember, and call your TU's DB's.

Guy DeLong of Jamestown, N. Y., Drowned in Lake Erie

Guy W. DeLong, plant superintendent of the Jamestown, N. Y., Telephone Corporation, was drowned in Lake Erie at Harrington Point Park, near Conneaut, Ohio, Saturday, August 24. Mr. DeLong was in bathing at the time, and it is presumed that he was attacked with cramp. Shortly after entering the water his cries for help attracted attention but he disappeared before help arrived.

Mr. DeLong was a son-in-law of John H. Wright, vice-president of the Jamestown Telephone Corporation. He was married to Agnes Wright in 1919, and Mrs. DeLong and a daughter, Lois Ellen DeLong, survive him.

Mr. DeLong was 33 years of age, and held responsible positions with the Truscon Steel Company after his graduation from the Ohio State University in 1915. He served his country in the late war, and returning to the United States he again re-entered the service of the Truscon Steel Company and became manager of one of the branch offices of that organization.

In 1924 Mr. DeLong was induced to become construction engineer of the Meadville (Pa.) Telephone Company, of which John H. Wright is a heavy stockholder. During 1927 he moved to Jamestown, where he became plant superintendent of the Jamestown Telephone Corporation.

Mr. DeLong was a member of the Methodist church of Meadville, of the Masonic lodge of Meadville, of the Masonic Consistory of Erie, and of the American Legion.

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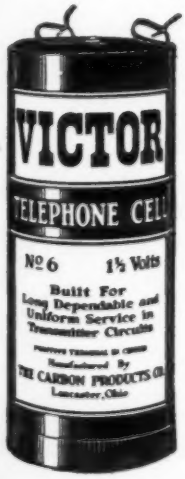

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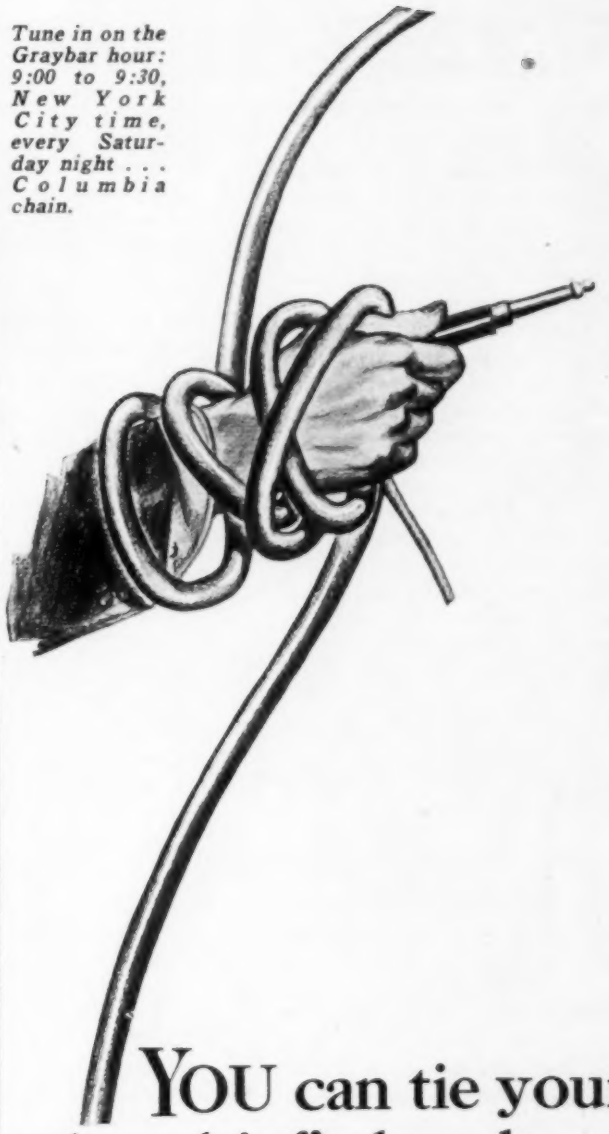

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Ramblings

By J. A. S.

On a short trip over into Indiana during August we stopped in to see our friends, Henry Barnhart and Roscoe Pontius, at Rochester. Friend Barnhart was somewhat puzzled over a couple of letters received by him from one of the large manufacturers of telephone equipment. One of the letters was from an executive of the firm stating that it was necessary to practice the strictest economy and they were reducing their advertising in the Indiana Bulletin, of which Mr. Barnhart feels a fatherly interest. Another letter was from the production department of the same concern, stating that on account of the heavy business the past year the order for equipment received from him had been held up some months, but to be patient and he would receive the shipment eventually.

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During the month of August the writer decided to make a trip east in his Pontiac "We Will." Stopping at Bellevue, Ohio, to see Frank Knapp we found that he was out of the berg attending duties that would keep him away a day or two; hence we did not wait for him. Spending the night in one of the excellent camps along Route No. 20 we stopped at Elyria next morning to pay a short visit to our old friends, Dutter and Curran of the Elyria Telephone Company. It was about 9:30, but was informed that these aristocrats of the telephone business would not be down for some time yet, so I again felt the aching void, but "schedules is schedules" and we had to make Cleveland early, so we drove on.

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Naturally a trip to Elyria would not be complete without a visit with Fred Heavens, who is again putting that town on the map as a manufacturer of telephone equipment. Many times in the past we visited Elyria and called at the offices of the Dean Electric Company; we still find Dean telephones in some of the exchanges. But with the passing of that firm we had heard nothing from Elyria except that it had a first-class telephone exchange. But just a year ago Heavens and associates put "Telering" on the market, and since that time exchange managers in many countries have had correspondence from that little Ohio city, and have profited by such correspondence. Just recently this concern, who has been operating under the name of the Colson Company, incorporated its business and is now operating under the name of "Telkor, Inc." Fred has a map of the world and tacks, indicating orders, are stuck in most of the foreign countries, and are fairly thick over the United States and Canada.

* * *

Finishing our work at Cleveland we accepted an invitation extended by Howard Leinard to lunch with him at one of the Cleveland-famous cafes. Thus we were in good humor and the detours just beyond that fine city could not deflect our feeling that life was indeed worth striving for. But the evening was well spent when we reached Erie, which was another disappointment.

* * *

At Jamestown we were taken in hand by none other than Lloyd Wright, who is doing such an excellent job in "carrying on" with the telephone business while his dad is "hitting the high places" putting over Wright Metal Inc. The latter concern seems to be "hitting on all six," but what couldn't with a man like John Wright behind it? Excavation for the new telephone building at Jamestown is well under way with indications that the exchange will be in operation ahead of the scheduled time. Lloyd stated that conditions in that part of New York state was very satisfactory. After lunch with Lloyd we departed east.

* * *

It was Saturday noon and less than 100 miles to Niagara, with nothing to be done till Monday morning, so what would an ordinary fellow do under the circumstances? As in most cases the frau made up our minds, and mid-afternoon found us winding our way along the beautiful river after crossing the "Peace Bridge" at Buffalo. Niagara Falls looked just like it did a year ago, and on other occasions when we visited it. In fact it looked exactly like the same water we saw rush over those rocks and drop into the great abyss many years ago. But after dinner, on the Canadian side (we found the usual signs in Canada but unusual in this country, where beer and other luxuries could be purchased), imbibing of the more or less liquid dinner, we drove back to the falls, parked our car just opposite a wonderfully round and well illuminated moon (in order to find the car without difficulty) and took another look at the falls. And man alive! You should have seen the difference. Talk about a camel making a whale of a difference, and walking a mile for one, we have seen fellows walk a week and get less. Whether it was the color effects thrown upon the falls at night or the aromatic dinner, we do not know—and we do not care. Believe it or not, if you want to see Niagara Falls in all its splendor, first consume a meal on the Canadian side, and then visit this wonderful stream; it doesn't make any difference what part you see. Even with your eyes shut you will enjoy it.

But we were distinctly disappointed in recrossing the border back into our own homeland. In anticipation of a "round with the federal inspectors," the wife packed our suitcases so that the new shirt, silk socks and her best lingerie would be displayed to the public, we started our triumphant trip back across the bridge. Imagine our surprise and indignation when a very civil looking gentlemen in uniform flagged us and asked how long we had been in Canada and what we had bought, if anything, while in that Dominion, and passed us on without even opening a grip or looking into the car. But I suppose everyone cannot receive a hair-raising thrill and we were the unlucky ones. Such is life.

* * *

In Rochester, N. Y., we had a very pleasant visit with Ben Woodbury; the same old Ben that hot-footed it over Ohio in the early days and warmed a cushion for Kellogg a while before finding a berth in the new modern factory of the Stromberg-Carlson Telephone Manufacturing Company. Roy McCann was another of the tribe of Stromberg-Carlson to give us "an audience" before trekking on to Broadway. This new factory of the Stromberg-Carlson company is a wonder.

* * *

In Lima, Ohio, we had a visit with friend Neuman of that city, who informed us that conditions were fine and that the organization was working like a clock, although under new ownership. The Fort Wayne, Ind., bunch was much elated over the fact that the International Harvester Company was spending a large sum in improving their properties in Fort Wayne, and that a radio manufacturer was moving his plant to their city. These and other city activities put the Home Tel & Tel. Company in a very optimistic frame of mind.

* * *

At Warsaw, Ind., we found the usual activities plus a modern building that would be a credit to a city much larger. Manager Scott is very busy these days looking after the interests of his organization in Warsaw and surrounding country.

* * *

We are in receipt of a letter from the Cuban Telephone Company, Habana, Cuba, stating that they had reproduced an article appearing in the May issue of TELEPHONE ENGINEER, and enclosing copies of the reprints, shown in Spanish. In his letter he says "We found . . . very interesting and instructive, and have had a part of it translated into Spanish and edited in the form of a publication which we circulate monthly among our employes."

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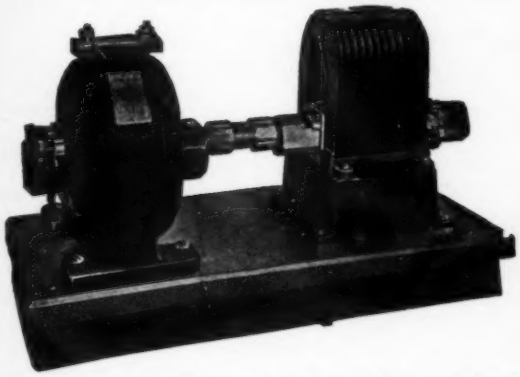

These units effectively replace all old-fashioned hand and battery ringing methods. Extreme simplicity of operation and low cost offer advantages over all other devices.

Cuts operating expenses by eliminating costly and troublesome battery equipment.

Make possible a swift, sure, carefree service that pleases both subscriber and operating company as well.

Can be supplied for any voltage or special current. A thorough test will convince you.

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Blow-torch operators prefer Prest-O-Lite. They like its hot, concentrated, easily controlled flame. They like its convenience, its instant readiness without pumping and preheating.

Ask your local Prest-O-Lite Gas Distributor to demonstrate this equipment for you or write us direct for complete information.

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The Importance of Vocational Training

By T. O. BREWER

Div. Supt. Plant Employment, Birmingham, Ala.

Training in industry is a combination of teaching and supervising. To be a successful trainer one must be a good teacher and a good supervisor. Show me a good supervisor who is also a good teacher and I'll show you a well trained personnel.

Training is, and always has been, a part of our everyday lives, whether at home, in school, at play, or on the job. To secure any finished product training is necessary to some extent. Training is not new in the telephone business or in any other business.

However, the telephone business is experiencing a very rapid growth and consequently the need for more and better training of telephone people is being recognized. Developments such as the dial system operation, the telephone typewriter, carrier current operation, and other special services have created a need for more and better training.

For many years the training of the plant personnel was not on a uniform basis, and when special training was desired, each division and even each city went about it in its own way. While this training was effective, as reflected in reduction of costs and accidents, and in improvement in quality of the work, the rapid growth of our company and the improvements in the art make it necessary to organize our training on a more definite and uniform basis. Telephone work, and particularly plant work, is of a highly specialized nature, requiring both technical and non-technical men and women to carry it on. Engineering work is usually looked upon as requiring technical men, while construction and maintenance work does not require so much technical training. An employe, regardless of his education and qualifications, must have some training at the time he enters the service, and employes already trained need additional training, particularly when something new has been developed.

Recognizing that telephone work requires trained men, we have set up a program to carry on the training work on a more definite and uniform basis. To carry on a well rounded training program it is necessary to train instructors in the art of teaching and prepare courses of instruction.

There are two places where this training program can be carried on, viz., on the job and in a centralized school. "On the job" training can be used in most cases and is probably the most effective. Training in centralized schools can usually be best carried out when some special training is desired for a group of people in a specified time, such as training switchmen prior to a dial office cutover. "On the job" training will usually not interfere with production and the training a man receives on the job is complete and gets him to production sooner. The training received in centralized schools cannot always be utilized as readily as when done in connection with productive work, so that it is sometimes necessary to do some "on the job" training before a man is completely trained.

There has been a great deal of discussion as to who should do the training. Since the foremen and supervisors tell the men what to do, there is an advantage in having them also show and tell them how to do it. Training is as much the responsibility of the foremen and supervisors as it is to get the job done. If the foremen and supervisors are to do training it is necessary that they be trained in the art of teaching.

To train foremen and supervisors in the art of teaching it is necessary for them to attend a vocational instructor training course. This course is for three weeks' duration. During that time they are taught the fundamentals of teaching.

A great many of us look upon teaching as being a very difficult task. Teaching is not difficult; it is an easy natural process which deals with the imparting of ideas. Everybody learns, and the things learned may be taught deliberately and consciously or they may be taught by chance or accident. The complete teaching process is to select a known idea, present the new idea and then make sure that the learner has properly associated the new knowledge and can use it. This is done in the vocational instructor training course.—Southern Telephone News.

Work to Begin on New Transmitting Station for KDKA

Work on the new transmitting station of KDKA near Saxonburg, Pa., will begin about September 15, it is announced. The transmitter itself is now under construction, but final details of the building are still to be worked out and the contract let.

The first broadcasts from the new station will be early in 1930, it is predicted. This will be the second big transmitter move of the pioneer station since it began broadcasting in 1920. The first was from the East Pittsburgh works to the present site on a hill above the works.

Westinghouse officials are reluctant about predicting the value of their radio equipment because of the fact that their own men built it, thus reducing the cost, and because experiments now being carried on may alter their plans and add materially to the final expense. It is known, however, that the station will embody the latest developments in the radio field, some of which have yet to receive their first test in actual use.

The new building is located a mile from Saxonburg on the road to Butler. The site was chosen only after extensive surveys and tests. Important among the reasons for the choice were the location on an elevated, rolling land, the presence of ground water near the surface, and the fact that no big industrial sections are nearby.

The building which will house the transmitter will be one story high in front with a deep basement which will be above the ground level in the rear. It will be similar to the building being erected for KYW in Chicago.

Originally 80 acres were purchased for the station site, but Westinghouse has just added 40 acres adjoining so that 120 acres of land are available for future development.

One of the interesting features of the new transmitter will be its use of the recently developed high-power tube. Although this tube has a nominal rating of 100,000 watts it actually has developed nearly 200,000. To allow for any desired signal strength and give the necessary margin of power required for modulation and make possible experimental work, the transmitter is designed to use six of the tubes.

The antenna of the new station will be of a type which will best carry out new ideas in transmission which are contemplated. Night 110-foot cedar poles will be used, thus doing away with the absorption present when steel towers are used.

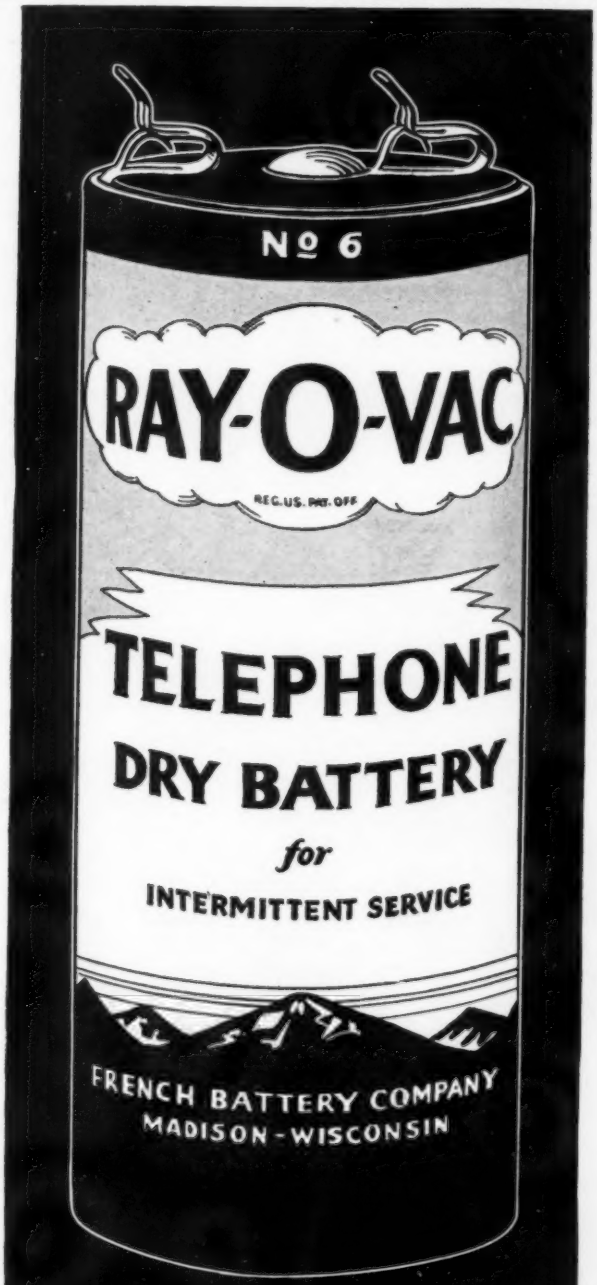
Power for the new station will be obtained by tapping two different substations of the West Penn Power Company. This will assure a continuous service, for the possibility of both lines being put out of commission at the same time is remote.

An artificial pond 100 feet wide and 200 feet long will be constructed to provide a constant supply of soft water for the cooling tubes. This is essential as the tubes have water-cooled grids, and the use of water with mineral content would shorten their life and lower their efficiency. Sufficient water will be stored in the pond for the dryest season.

September District Meetings for Illinois

Two big district meetings are planned for the month of September. The first one will be held at Carlinville on Wednesday, September 18th, and the last district meeting of the year will be at Murphysboro on Friday, September 20th.

LONGER LIFE IN SERVICE...QUICKER COMEBACK



You get something more than a battery when you buy a Ray-O-Vac Telephone Battery . . . you get longer service, and staying power plus, and a snappier, quicker comeback that lasts all through the battery's long life. So why not standardize on Ray-O-Vac's...then you're always sure of getting your money's worth...and more. And remember that Ray-O-Vac Telephone Batteries don't cost any more than other kinds.

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The French Battery Company make Ray-O-Vac Ignition, Radio and Flashlight Batteries and Ray-O-Vac Rotomatic Searchlights.

RAY-O-VAC
TELEPHONE BATTERIES

Five Indiana Phone Properties Sold

Sale of five Indiana telephone companies, involving property with an estimated value of $1,500,000, was announced September 4th by Max F. Hosea, Indianapolis attorney and president of the Indiana Telephone Securities Corp. of Indianapolis.

The purchaser was the Associated Telephone Utilities Corp. of Chicago, operators of numerous telephone companies in several states.

Transaction Completed

Announcement of completion of the transaction was made by Mr. Hosea on his return from Chicago.

The five companies were only a small portion of Mr. Hosea's holdings. He and the holding company, of which he is the president, own and operate about forty telephone properties in Indiana and Illinois.

Companies Involved

The companies included in the transfer are the Greencastle Telephone Co., serving about 1,700 subscribers; the Logansport Home Telephone Co., 7,000 subscribers; the Putnam County Telephone Co., which is exclusively a long distance company; the Steuben County Telephone Co., which serves 2,400 subscribers in Angola and vicinity, and the Royal Center Telephone Co. with 500 subscribers.

Besides Mr. Hosea, officers of the Indiana Telephone Securities Corp. are Joseph W. Stickney, secretary and treasurer, and Wendell Sherk, vice-president. Mr. Stickney operates the Fletcher-American Insurance Agency, Fletcher-American National Bank Building. Mr. Sherk is vice-president of the Fletcher-American Co.

A New and Improved Form of Thermo-Couple

The Roller-Smith Company, 233 Broadway, New York City, announce a new issue of their bulletin No. 810, covering its Types TW, FW and STW thermo-couple ammeters and milli-ammeters for direct current and alternating current of all frequencies, including radio frequencies.

These instruments incorporate a new and improved form of thermo-couple which is distinguished by very high overload capacity and sustained accuracy over a wide range of temperature.

We are not dead certain about it, but we believe that if you will address a letter to Mr. G. L. Crosby, vice-president (sales), he will send you a copy of the new Bulletin No. 810 together with photographs and cuts that are now available. Of course, you'll mention TELEPHONE ENGINEER when writing these folks.

Selling by Telephone

The First Striking Advance in Salesmanship Technique and Economy in 25 Years is thoroughly discussed in a new book, "Selling by Telephone," by J. George Fredrick, president of the Business Bourse of New York City.

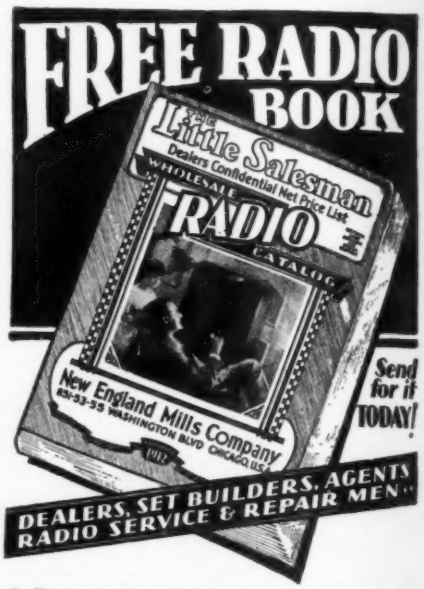
Every general sales executive should closely study this book, for he may find it the key to important sales organization. Every salesman, selling any article whatsoever, can very definitely improve his selling technique by reading this book. Every retail store manager should by all means study this book, so full of vital suggestions for sales development in his store. Every retail salesperson should read the book and learn how to become a good telephone salesman—the higsest priced, most sought after ability in selling today. Every business man, of whatever function, should read this book for its great aid in forming new policies based on selling by telephone. Price of book is $4. Send your order today direct to Telephone Engineer Publishing Co., Ogden Bldg., Chicago.

Choosing the Right Type of Squirrel Cage Motors

Seven types of squirrel cage motors are discussed and compared with each other in the new 24-page bulletin 165 issued by Wagner Electric Corporation, under the headings of general purpose, normal-torque across-the-line, low-torque across-the-line, high torque double-squirrel cage, punch press and elevator types. The bulletin is divided into several sections, one discussing the three factors interesting motor buyers (cost, performance and delivery), another analyzes and compares the starting and running characteristics of the various types of squirrel cage motors, and there are other sections devoted to detailed description of construction, ventilation, lubrication and mechanical diversifications. Speed-torque curves, a table of comparative prices and a detailed table of electrical and mechanical characteristics, with a discussion of applications, help the motor buyer to choose the right type of squirrel cage motor for each job. Histories of the development of double squirrel cage motors, directed-draft ventilation, and air-jacketed motors add reader interest to the bulletin. The bulletin is, in the words of the authors, "the first attempt on the part of a motor manufacturer to explain to motor buyers and users the difference between the various types of squirrel cage motors." It is, in fact, a short text-book, destined to minimize motor-misapplication in industry. Anyone desiring a copy should address Wagner Electric Corporation, St. Louis, and ask for bulletin 165.

Illinois State Convention Plans Progressing

The president of your association has completed the appointments on the 12 major committees for the Silver Jubilee Convention. A total of 79 different people are serving on these committees to make our 25th anniversary meeting the most successful convention ever held. Each committee member has been notified of his appointment and advised concerning the duties of the committee. The dates are Wednesday and Thursday, November 20 and 21, 1929.



NEW ENGLAND MILLS offers everything in radio at **Wholesale Prices** that spell **real savings!** That's what you will find in this great catalog just off the press, featuring Radio's newest creations in sets, kits, parts and supplies. Everything in our catalog is backed by the guarantee of this old, stable concern and its vast resources, accumulated through 17 years of faithful service to its customers.

Radio Dealers Save Money
on complete radio sets of every description, dynamic and magnetic speakers, A. C. and all other types of tubes, eliminators, batteries, radio cabinets—in fact everything required by dealers for resale or servicing. Buy right, sell right and make money.

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Earn big money by rebuilding and modernizing old sets. Catalog contains everything required for this work; also the **latest nationally renowned kits**—knocked down or completely assembled chassis ready to install in table or console cabinets, all at **wholesale prices.**

A. C. Electric Radios
Large selections of the finest A. C. Electric, 6, 7, 8 and 9 tube chassis and complete sets obtainable at the amazingly low prices we quote. Every modern radio improvement is embodied in these **marvelous electric radios. Backed by guarantee of satisfaction** of this 17 year old institution.

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Rural communities with homes not wired for electric radios offer a good market for battery sets, repairs and replacements. We have a **large stock of batteries, eliminators, speakers, tubes, transformers, coils,** and all kinds of accessories for battery sets. **Best known, nationally advertised goods,** such as **Cunningham, Sonatron** and **Arcturus tubes, Burgess batteries, Jewel instruments, Belden Products, Utah, Temple, Farrand** and other popular **dynamic** and **magnetic speakers.**

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Radio dealers, agents, set builders, service men, etc., cannot afford to be without the New England Mills catalog. We maintain a complete radio service department, supervised by expert radio engineers who will help you with all your radio problems. All goods catalogued are stocked for immediate shipment. Write for this book today. It's FREE! Send request on business stationery. **Catalog also contains complete line of tires, tubes, auto supplies, electrical and sporting goods.**

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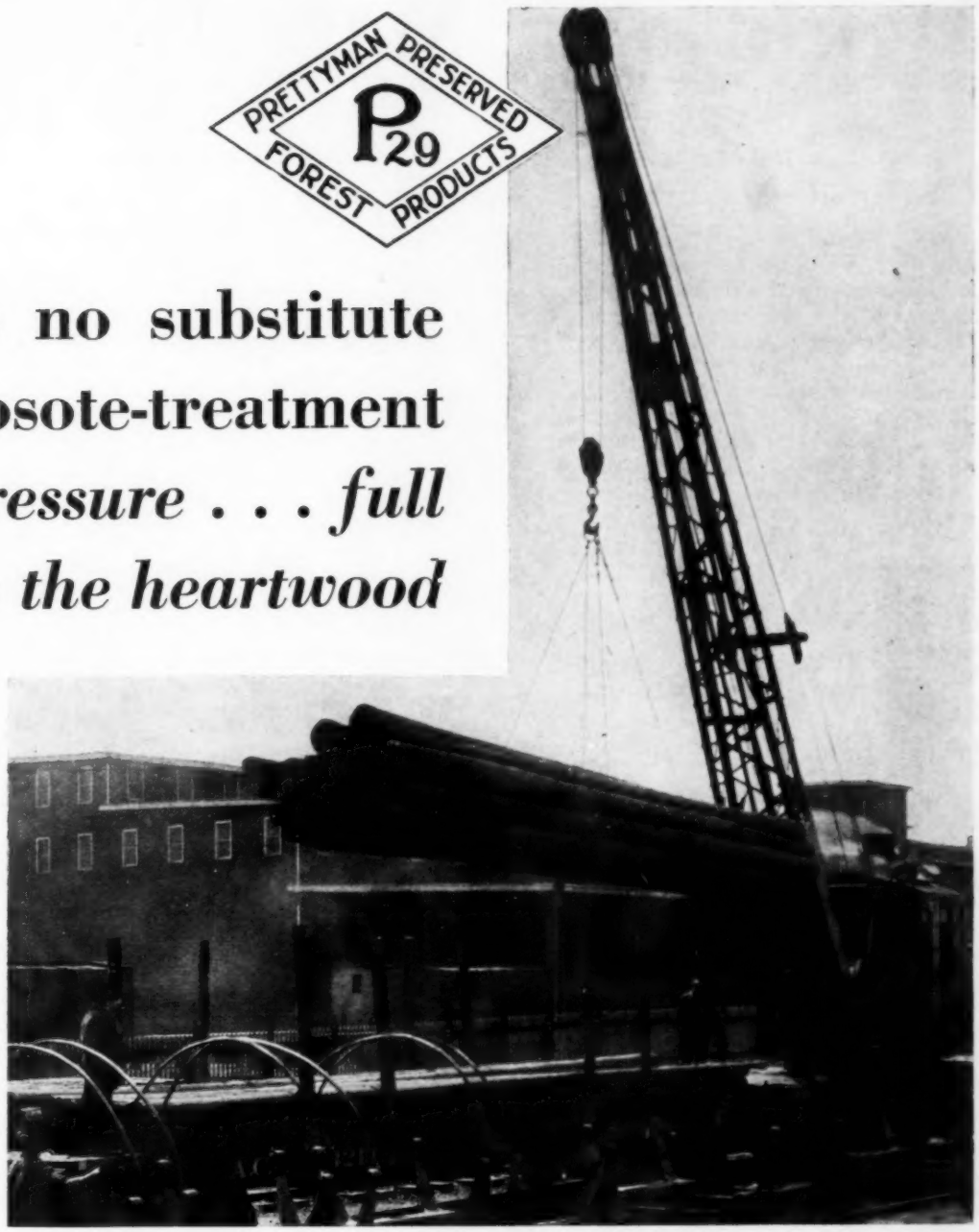
PRETTYMAN PRESERVED P29 FOREST PRODUCTS

There is no substitute for creosote-treatment *under pressure . . . full length to the heartwood*



Lick-and-promise treating methods . . . surface treatments . . . part-length treatments . . . often make a pole last longer than it would untreated.

But it takes a sound, Southern Yellow Pine Pole, pressure-treated full length to the heartwood with Grade 1 creosote oil—in short, a Prettyman Preserved Pine Pole—to stand up under a heavy line load 25 to 40 years . . . withstanding the ravages of insects and woodpeckers . . . surviving storms...bearing up under heavy ice loads.

A Prettyman Preserved Pine Pole is completely protected. Not in spots . . . not merely on the surface . . . but every inch of its length, right through to the strong, dense heartwood.

And these completely protected, stronger, longer-lasting poles are more economical. They cost less per year of service. Write today for prices and interesting literature.

J. F. Prettyman & Sons
Wood Preserving Plant
Charleston, S. C.

World Still Marvels at Radio

{ Home Talkies Promised for Near Future—Television Challenges the Master Minds—Short Wave Sets Building Up a Friendly Intercourse with All Nations of the Globe.—By W. C. Dillon }

Home Talkies Promised This Fall—A number of systems are approaching the commercial stage for home use and are due to be on the market this fall. They are being perfected by several large organizations and individuals. There will be talking pictures with sound included in the film. The equipment will include a steady light source and photo electric cell, together with a special amplifier, or the usual radio set amplifier and loud speaker will be used. In some cases a special head will be used with the ordinary home movie projector. No doubt, we can look forward to taking pictures with a home movie machine registering sound at the same time. We are of the opinion that it will not take young "Bill" or "Jack" long to get his "money's worth" out of such a machine, especially if he has a sister with a "sheik."

* * *

Television Challenges the Master Minds—It is now beyond the laboratory stage, as shown by the fact that Radio Silhouette Movies are now being enjoyed by 30,000 amateur television fans. Manufactured sets are now on the market. We know that television, so far developed, is still in the experimental stage, and that home-made sets will, no doubt, give the builder a thrill when he beholds his first picture that will surpass his first DX efforts in bringing in music. Parts are now on sale, and television will be developed very rapidly as soon as "sight broadcasters" are on the air in greater numbers than at present. Under laboratory tests, broadcasted images have been reproduced clearly and in motion, and just about in their natural colors. The pictures were small, appearing to be about two inches square.

* * *

Short Wave Sets Are Building Up a Friendly Intercourse with All Nations of the Globe—Members of the fifteen thousand transmitting amateurs in the United States consider it as part of their nightly program to get in touch with some foreign friend on the opposite side of the globe (in less time than it takes to warm up the motors of the Graf Zeppelin) and have a code chat with him. It was thought by experts that it could not be done, but there are some people still who do not know "it can't be done," and these "hams" rubbed the wise spots on their heads, got busy, and now they are gossiping with all parts of the world each night. Dependable short wave sets can now be purchased, also parts for making them in case you wish to "roll your own," which naturally puts an extra "kick" into bringing in your first station from across the pond.

* * *

Interference from Electric Signs, Flat Irons, and What-Not Raises High Blood Pressure—And you can't blame Mr. Set User for his attitude. Especially now that it has been demonstrated that such conditions can, in most all cases, be eliminated. We understand that one company alone has examined and classified thousands of pieces of electrical apparatus and, where necessary, designed specific filterettes to suppress interference therefrom. The Saturday Evening Post has carried advertisements of products whose manufacturers boast: "This apparatus will not interfere with radio reception." Publicity is being given to the adoption of anti-interference legislation, thousands of pieces of literature have been distributed of existing and proposed ordinances against interference. Listeners' and interference clubs, numbering well into the thousands, have been organized, representing by no small means a negligible political factor in the fight against this needless evil. Interference "cross-talk" with the telephone man had him "wozzie" long years before the advent of radio. Slipping back into the past, the writer well remembers his first experience during 1896-97 out in Kansas when a toll line and a rural line had him chasing a "phantom" short over a long period of time. Radio set users have been having telephone men chasing "phantom" interference in their exchange equipment for some time past, when in many instances they have not been guilty. Interference can and is being eliminated; it is a constant challenge; therefore, interesting to defeat.

* * *

Spare Time Plus Radio Doctoring Equals Coin of the Realm—To the men in the telephone field who are taking advantage of the public demand for them to rebuild (during their spare time) old sets, replacing the old time equipment, and bringing them up to date; also in clearing trouble in the sets, putting up aerials, etc., etc. Due to the close contact telephone men have had with the public prior to the advent of radio, as well as at present, they are looked upon as logical men for the radio public to tell its troubles to, and they sure DO have their troubles to tell. Naturally telephone men have been cashing-in on this condition during their spare time at night. These men have in many instances developed a hobby which carries with it a financial remuneration (also a hot reception when they reach home after the "dead-line hour"). You telephone men, linemen and trouble shooters will, we think, have to battle out your own salvation when it comes to getting out of the difficulty experienced by keeping late hours.

Perhaps we have been "asleep at the switch" in not having placed at your disposal long ago means by which you can increase your financial gain in the use of your spare time with radio. We are, therefore, placing you in a position now to get in touch with radio firms from whom you can purchase all necessary supplies and resell them at a profit to yourself. This should prove interesting to every "live wire." In this issue of TELEPHONE ENGINEER you will find the advertisements of firms ready to furnish you supplies at attractive prices.

And speaking again about the "COIN OF THE REALM," just recently a telephone man was telling how he has been making a little "extra" now and then, and said that during the past two or three years he has averaged from $15 to $45 "extra pay" each month from radio work done during his spare time. It seems as natural for a telephone man to want to advance himself in the electrical arts (and palm some of the coin of the realm) as it is for Lindbergh to want to fly, or a "culled gent" to indulge in African golf.

Therefore, boys of the telephone and radio field, we have lined up some firms whose advertisements appear in this issue from whom you can purchase complete equipment or simply the parts, which you resell at a profit to yourself, thereby increasing your earnings during your spare time.

Christmas is just around the corner—perhaps less than 100 days away—so go to it, boys, but don't jeopardize your regular job and don't give the folks at home the impression (by too much night work) that you are a radio "extremist" or "nut." Read TELEPHONE ENGINEER regularly each issue, as we are going to have some mighty interesting articles in each issue. Items of vital interest to you all. These items will prove our assertion that we are an up and going organization and on our toes all the time.

Northern White Cedar Poles

Northern White Cedar Poles in lines of Chicago Telephone Co., on Wentworth Ave., south from 61st St. Set in 1899.

Far in the Lead!

THERE are more Northern White Cedar Poles in use in telephone lines than any other kind.

What greater proof could there be that Northern White Cedar poles are proving most efficient, satisfactory and economical?

The same happy combination of advantages that made Northern White Cedar "original" pole timber is still the standard comparison for all telephone poles.

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Northern White Cedar Association

Minneapolis - Minnesota

Time-Tested — Why Experiment?

News of the Manufacturers

Kellogg on Job When Storm Damages Devils Lake Telephone System

It was fortunate for Devils Lake, North Dakota, that Kellogg was on the job when heavy windstorms accompanied by a terrific cloudburst damaged the telephone system there, putting 500 lines out of commission. On June 7th, just the day before this catastrophe occurred, the Kellogg Switchboard & Supply Company had commenced the cutover of a new Kellogg Service Switchboard in the Devils Lake Central Exchange. It was useless to repair the old cables and leads so all efforts were bent toward cutting over the new board. By strenuous work and excellent management all lines were working in two days.

The construction program at Devils Lake is only a part of the development work which will be undertaken by the Dakota Public Service Company, a subsidiary of the Central West Public Service Company. When the Dakota Public Service Company purchased the property at Devils Lake some time ago the officials of the telephone company promised the citizens a telephone system worthy of the slogan, "Wide Awake Devils Lake." In keeping with this promise the outside plant was entirely rebuilt and a commodious modern building was erected to house the equipment and to provide space for the district offices which are located at Devils Lake.

To make complete the promise of the Dakota Public Service Company for a telephone system second to none, a Kellogg Service Switchboard was chosen as representing the fastest and most modern telephone service possible. The board, now installed in the new exchange at Devils Lake, is equipped with six positions, No. 1 being the toll position and No. 2 the rural position, equipped with universal feature cord circuits. Positions No. 3 and No. 4 are local with common battery feature cord circuits. The board has an ultimate capacity of 1600 lines with 1000 local lines now installed.

Because of the modern improvements on the Kellogg Switchboard the Dakota Public Service Company is able to offer their subscribers a higher class of telephone service. The enthusiastic response of the citizens of Devils Lake to the advantages of the new system was indicated by the large number of people who made arrangements to have this better service installed in their homes and business houses. Changes of this sort mean progress for the community and prosperity for the telephone company.

The Northwestern Bell Telephone Company operates its own toll office in the new building and has a four position toll board. It is expected that within another year repeater and carrier current equipment will be installed making Devils Lake one of the important centers of the Northwest.

On June 20th the Dakota Public Service Company held open house to celebrate the completion of the new telephone system. It was a gala day in Devils Lake, numerous telegrams of congratulation and flowers helping to celebrate "Devils Lake Going Kellogg." Mr. Frank Milhollan, president, and Mr. F. M. Parsons, telephone superintendent of the Dakota Public Service Company, were present during the festivities. Mr. W. A. Martin, district manager, John Climie, local manager, and Miss Doyle, district traffic supervisor, assisted in showing the numerous visitors through the new exchange, and demonstrating the efficiency of the new Kellogg Service Switchboard.

Not so long ago, Devils Lake was little more than an Indian trading village, hiding away in the center of the lake region of North Dakota. Now it is the commercial and jobbing center for a large farming territory, a territory that is rapidly solving its own farm relief problem by turning to dairying as is evidenced by the thriving and growing business of the Fairmont Creamery Company.

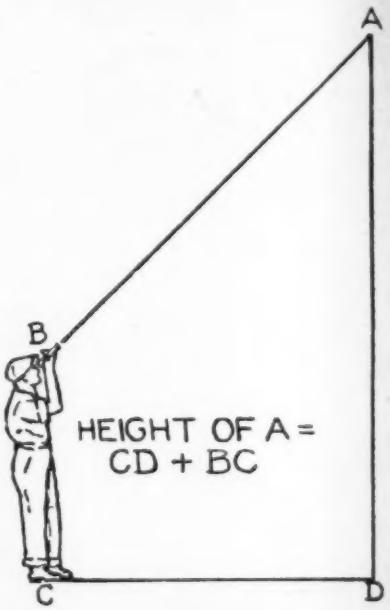
Blanketed Indians and modern telephone systems are a queer combination but Devils Lake boasts of both. The Fort Totten Indian agency and reservation is near the city and Indians are a common sight on the city streets. The Indian with his picturesque costume is no novelty to the people of Devils Lake, but the combination of a "blanket Indian" squaw with a modern flapper daughter, occasionally seen in town, is a sight which merits a second glance.

In spite of the impression that Indians are the sign of a frontier town, Devils Lake has far outgrown this title, for it is as modern a city of about 6,000 as will be found. Its miles of paved streets, its white way, its three modern hotels, stores, apartment houses, and fine residences give it the appearance of a city even larger than it really is. On the shores of Devils Lake is located Camp Grafton, where the North Dakota National Guard has its camp. Every year thousands of the state's young men spend the summer there.

And now, with the addition of the beautiful new building and the installation of the Kellogg Switchboard, "Wide Awake Devils Lake" is a little more wide awake than ever before.

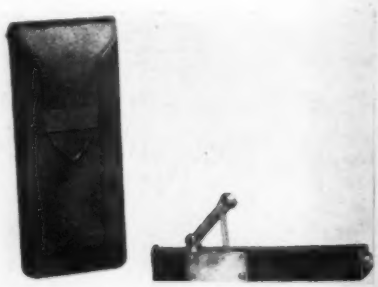
Teleheight Is New Invention of W. N. Matthews Corporation

Type CW Matthews Teleheight is new instrument that quickly figures height of poles, wires, buildings, etc. Can be carried in vest pocket.



Method of using the teleheight

It is no longer necessary for linemen, foremen, inspectors or engineers to guess at pole, cross-arm or building heights when figuring wire clearances, anchor guy lengths, etc. The W. N. Matthews Corporation of St. Louis, Mo., manufacture an economical instrument called the Type CW Matthews Teleheight. By merely sighting to top of object through the Teleheight, the height in feet is quickly computed. To find height of object "A," stand away from "A" until bubble and line in the Teleheight cross each other. Measure off distance "CD" and "CB." The sum will equal height in feet of "AD." This instrument can be furnished with or without leather carrying case. Can be handily carried in the vest pocket.



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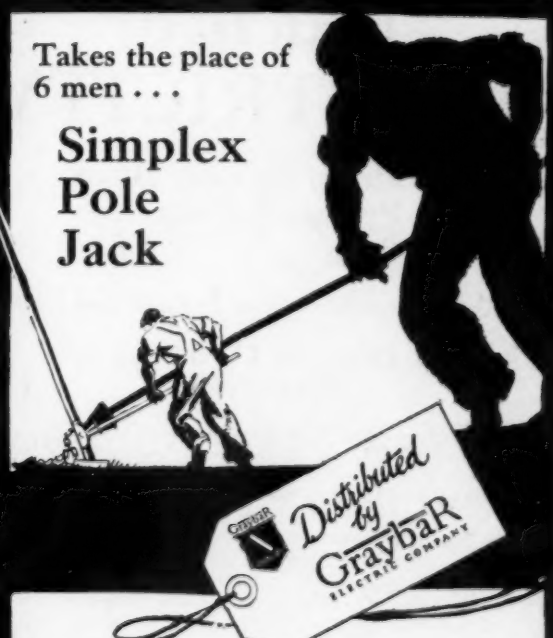

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Ralph Johnson Promoted at Fort Wayne, Ind.

Promotion of Ralph Johnson, Student Engineer, to the position of plant engineer for the Home Telephone and Telegraph Company of Fort Wayne, Indiana, has been announced by Harry E. Gray, general plant superintendent and chief engineer.

Mr. Johnson will have supervision of the plant engineering department. He will report to the general plant superintendent and chief engineer.

Mr. Johnson entered the employ of the Home Telephone and Telegraph Company on March 7, 1922. At that time he was employed in the instrument repair shop. In a short time he was transferred to the Cable Department where he worked until 1924 when he was transferred to the engineering department as a student engineer. He acted in that capacity until his present promotion.

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5 Million Pension Fund Set Aside by Postal Telegraph

An initial fund of $5,000,000 has been set aside by the directors of the Postal Telegraph Cable Co. for administration of a new pension and benefit plan, involving about 20,000 employes, effective July 1.

The plan is designed after that of the International Telephone & Telegraph Co., with which the Postal is affiliated, according to Clarence H. Mackey, president, who made the announcement today.

Under the new plan, male employes may be retired after thay have reached the age of 60 and women employes may be pensioned any time after they are 55. The retirement pension is payable monthly during the life of the retired employe and amounts annually to 1½ per cent of his average annual pay during his term of service, multiplied by the number of years of service.

Senate Blocks Phone Rivalry

Madison, Wis.—Public ownership of utilities received a serious setback Tuesday when the senate defeated a bill by Senator W. H. Hunt, River Falls, to authorize municipalities and co-operative farm associations to organize telephone companies in competition with privately operated utilities. The vote was 16 to 8 and may reflect the attitude of the senate toward other public utility bills which are pending in the assembly.

"Privately owned telephone companies can and will give service to the farmers if obliged to do so," said Senator Hunt. He argued that utilities are spending large sums of money to get textbooks written to influence sentiment against public ownership.

J. W. Becker Heads Turner Brass Works

It affords us real pleasure to announce the appointment of Mr. J. Walter Becker as general manager of The Turner Brass Works, Sycamore, Ill.

After his graduation from the University of Wisconsin as an engineer, he followed the calling of sales engineer for several years, and for the past fifteen years had been general manager of the Ideal Commutator Dresser Company of Sycamore.

As the administrative officer of The Turner Brass Works, we know that Mr. Becker will strictly maintain the quality product of the company at a reasonable or popular price, and still maintain the previous policies as set down by the company of a jobber-dealer distribution.

Mr. Becker comes well equipped, knowing the dealers' as well as the jobbers' problem, and we speak for him a successful administration of the affairs, knowing as he does, the manufacturing as well as the sales policy. Knowing the problems of the dealers as well as the jobbers, he can lend a sympathetic ear to their trials and tribulations, thereby helping them a great deal more than a man of less experience. Our sincere well wishes to you, Mr. Becker, and congratulations to The Turner Brass Works in having secured the services of so valuable a man.

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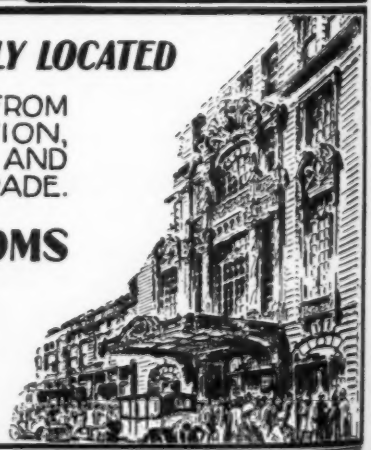

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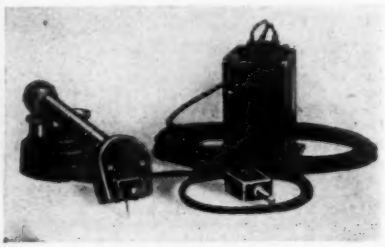
This outfit differs from previous models in that the pick-up unit or head is of the low impedance flexible armature type. As no scratch filter is incorporated in the outfit, the volume control is mounted in the base of the pick-up arm to provide compactness. Due to the fact that the



No. 3-A Stromberg-Carlson magnetic pick-up

voltage generated by the low impedance pick-up unit is very low, a step-up transformer is provided to raise the voltages to a value suitable for operating the audio amplifier. This transformer is placed close to the receiver chassis to avoid capacity effects in the long cord connecting it to the phonograph. Being inclosed in a finely finished brown enamel case, the transformer can be left loose on the table, back of the receiver. If desired, however, it may be fastened in a concealed position to the bottom of the table or cabinet on which the receiver is mounted.

Flexible armature operation is provided in the No. 3-A pick-up by having the armature shorter and lighter in weight and by using a more flexible cushion. This great flexibility as compared with the larger armatures on high impedance pick-up heads reduces wear on phonograph records, increasing the life of the record in some cases by as much as thirty times.

A new design of counter-balancing spring is provided in the swivel joint of the pick-up arm with a view of providing the correct weight on the needle point as well as to insure against any rattling in the joint when the pick-up is operating on a record. This No. 3-A pick-up is designed only for operation with full-tone needles.

The Texas Creosoting Company Established Department of Petroleum

The Texas Creosoting Company of Orange, Texas, and Houston, Texas, announces the formation of a Department of Petroleum. The purpose of this department is to place at the disposal of the oil industry throughout the world a creosoting service particularly adapted to its needs.

Arrangements are being made with a number of oil companies so that creosoted timbers, planks and piles for rig foundations to meet their particular needs will be kept in stock for immediate delivery.

Mr. E. R. "Bob" Ames, former Mid-Continent and Gulf Coast manager for the Elliott Core Drilling Company, has been placed at the head of this Department of Petroleum. Mr. Ames is a well-known petroleum engineer, and will give special emphasis to a consultation service.

The problem of creosoted timber service has become acute with the exploitation of the Louisiana Salt Dome fields, where location is frequently on the water or swamp. The Teredo infested water of this region makes the use of untreated timber almost impossible.

The Texas Creosoting Company is the manufacturer of "BLACK BEAUTY" products, used extensively by railroad and electric power companies. Their red-top creosoted poles are frequently seen along pipe lines leading from oil fields.

Jay G. Mitchell, who for many years guided the destinies of the Illinois Telephone Association as its secretary at headquarters in Springfield, and who resigned early this year, is now on the executive staff of the Associated Telephone Utilities Company, with headquarters at Madison, Wis. Jay has charge of rate matters for the various properties of that organization. There is not a better qualified man in the industry for this work than Jay Mitchell.

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Kellogg No. 34 2-M. F. Condensers @	.40
Western Elec. No. 20 desk set with W. E. Trans. & Rec. and new cabinet inside connection signal set 3-bar 1000 or 1600 ohm $10.00—4-bar $10.75—5-bar @	11.75
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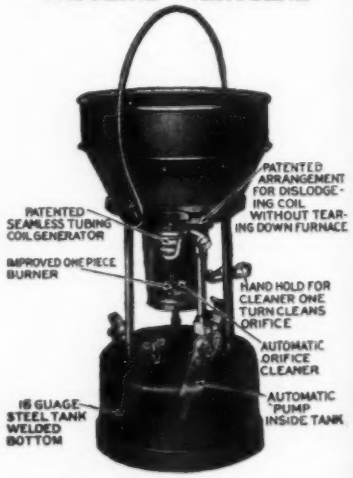
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Literature?

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Telering, the Ringing Machine, to Be Made and Sold Through a New Corporation

The growing demand for Telering made it advisable to organize a separate corporation known as Telkor, Inc., which has been organized under the laws of the State of Ohio for the purpose of taking over the manufacture and distribution of this machine from The Colson Company, together with all rights and title thereto as of August 12th, 1929.

The manufacturing activities of Telkor, Inc., will be closely associated with those of The Colson Company.

Fred J. Heavens, as vice-president and general manager, will direct the sales and distribution for Telkor, Inc., as he has done since Telering was first placed on the market.

The factory and general offices of the new corporation will remain in Elyria, Ohio.

Westinghouse Develops New Metal

Development of a new metal known as "Konel," which is credited with being much stronger than other metals at high temperatures and which can be used extensively in the moving parts of internal combustion engines and other extremely hot places, has been announced by officials of the Westinghouse Electric and Manufacturing Company. The announcement followed the granting of foreign patent rights.

Originally developed by the Westinghouse Research Laboratories as a substitute for platinum in the manufacture of filaments for radio tubes, the new metal was discovered to be harder to forge than steel, and to be very tough at high temperatures, when most metals lose their strength. Engineers predict many uses for Konel.

Platinum costs approximately $180 per ounce, while the new substance costs only a few dollars a pound. Life of Konel filaments is approximately ten times longer than other filaments. Tubes with filaments made of the new metal are operated 175 degrees colder than tubes with platinum filaments but with the same emission, thereby giving better reception results, research engineers say.

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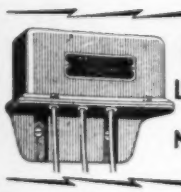
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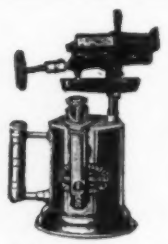

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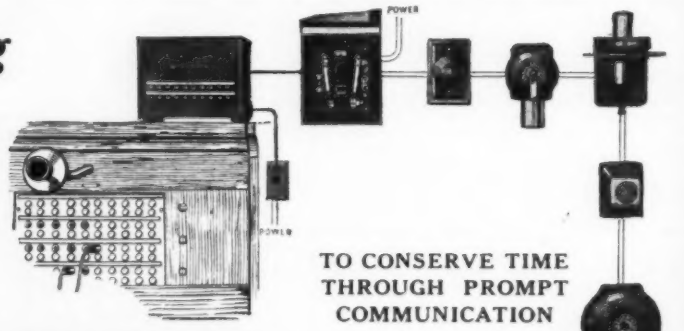

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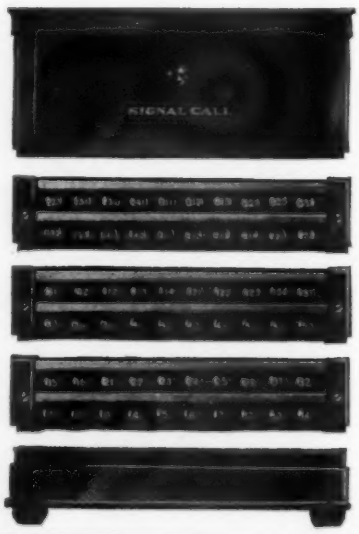

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TELEPHONE ENGINEER

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PUBLISHED MONTHLY BY

TELEPHONE ENGINEER PUBLISHING COMPANY

J. A. SMITH, 192 N. Clark St., Chicago, President and Treasurer
C. L. JONES, Athens, Ohio, Vice-President
D. WEINER, 192 N. Clark St., Chicago, Secretary
F. A. BOWDLE, Cerro Gordo, Illinois, Vice-President

No. 10 October
Vol. 33 1929

SUBSCRIPTIONS:—The subscription price of TELEPHONE ENGINEER is $2.00 a year in the United States, Cuba and Mexico; in Canada it is $3; in all other countries $4. Single copies, U. S. A., 20 cents.

Entered as second-class matter, June 6, 1922, at the post office at Chicago, Ill., under the act of March 3, 1879

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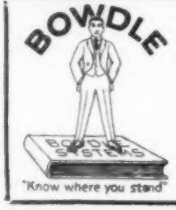

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